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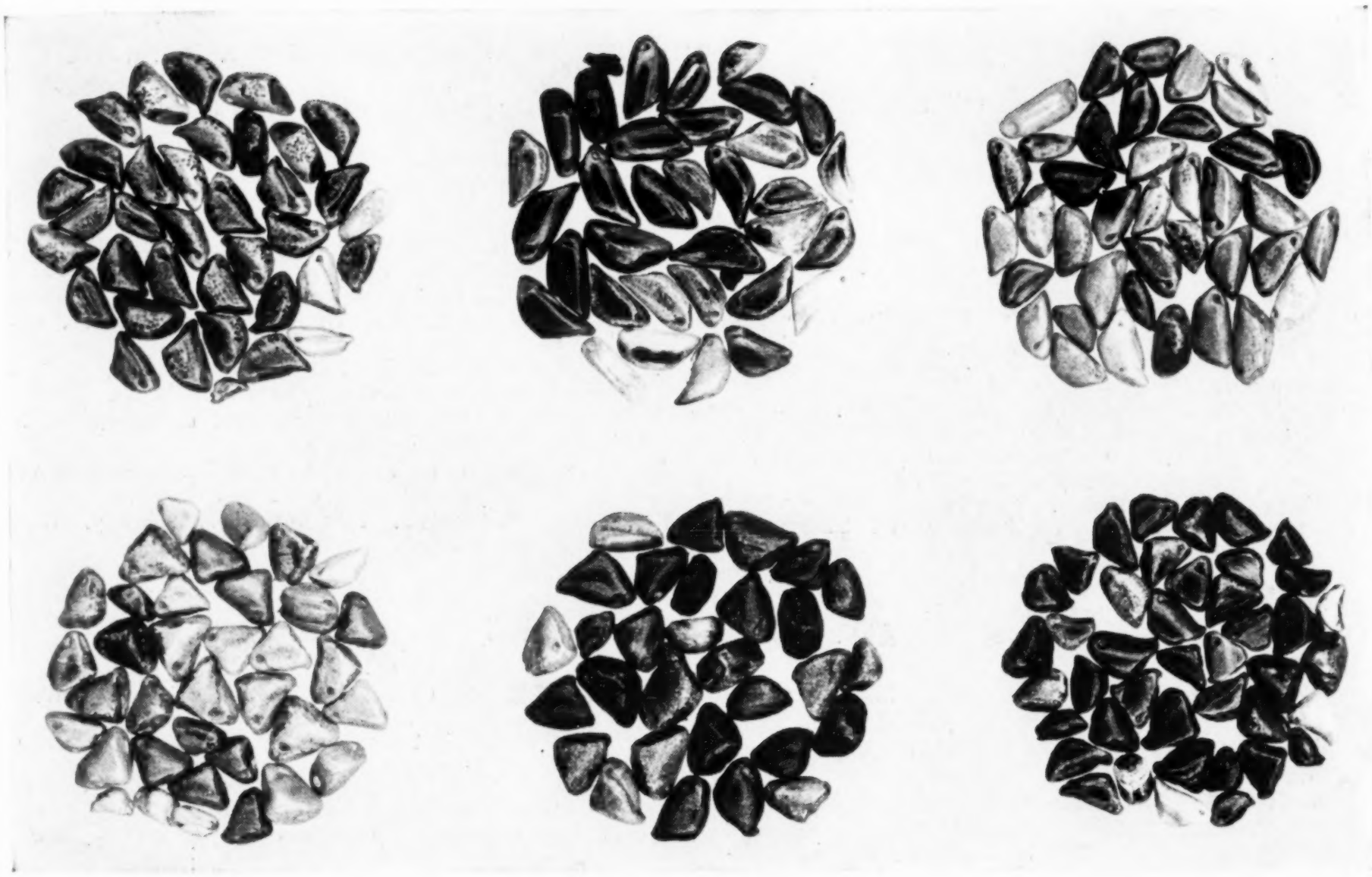

SEED OF TEOSINTE, NEAREST WILD RELATIVE OF MAIZE

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Identical Quadruplets From Michigan

Friedreich's Ataxia, An Inherited Nervous Disease

"Oxygen and Everest," Another Sense-Difference

"Cretins"(?) in Poultry

The Congresses of Genetics and Eugenics

Costs of Mental Disease and Deficiency

VOLUME 23 JULY, 1932 NUMBER 7

The American Genetic Association

An incorporated organization devoted to promoting a knowledge of the laws of heredity and their application to the improvement of plants, animals, and human racial stocks

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The

Journal of Heredity

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The Third International Congress of Eugenics

New York City

August 21-23

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The Sixth International Congress of Genetics

Ithaca, New York

August 24-31

See Announcement, Page 284, This Issue.

In the August Journal:

Mechanical Separation of Gametes
Identical Twins Reared Apart
White Indians in Panama in 1681
Forms of Hereditary Blindness
Odema Inherited
World Migrations
An Index of Human Fitness
How Mutton Gets That Way
Aging and X-raying Drosophila Eggs

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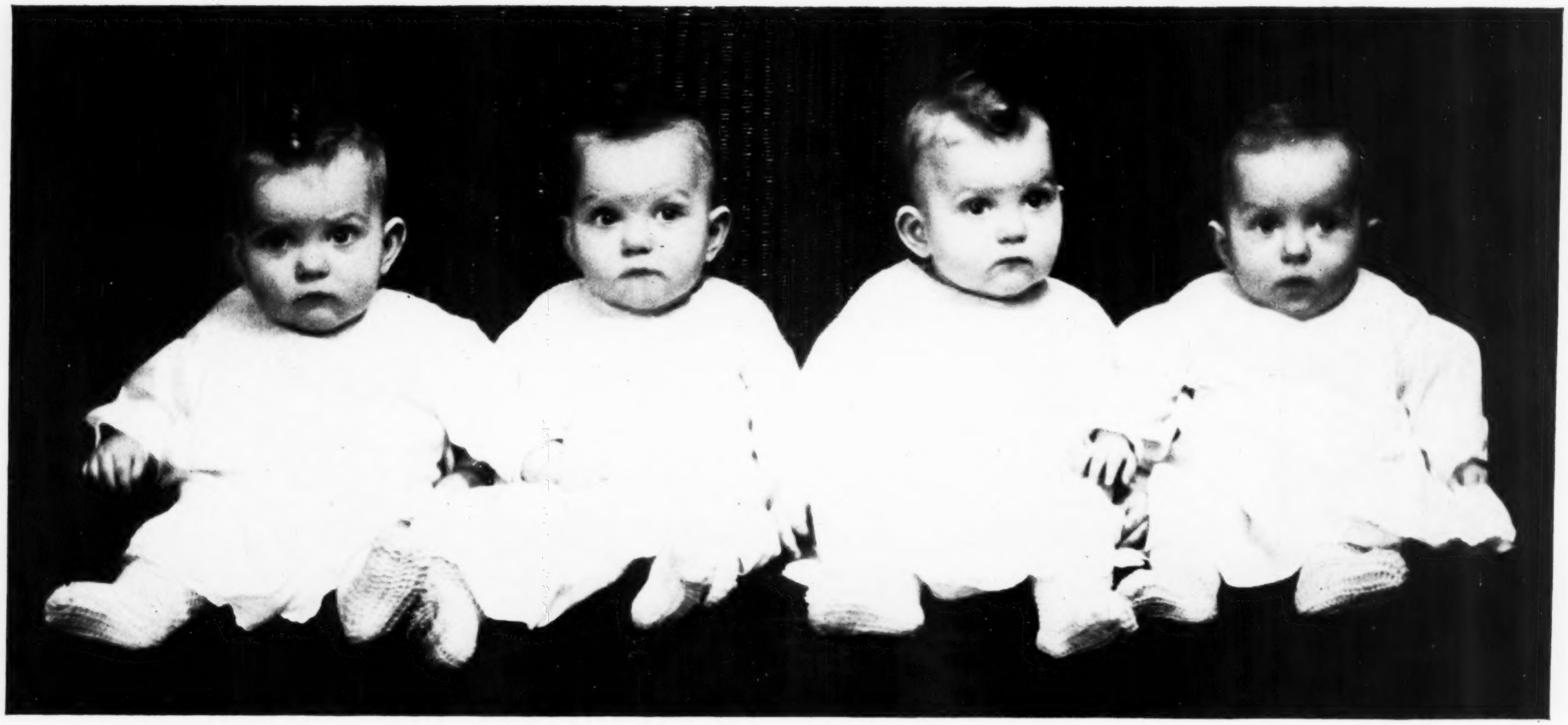

FOUR OF A KIND

Frontispiece

These four young ladies arrived in Michigan on May 9, 1930. While at birth they differed as much as a pound and a half in weight, nevertheless the resemblance which they show in a number of characteristics, and in fingerprint patterns, indicates that they are identical quadruplets. If this is the case, genetically each girl is what the others might have been. If the fortunes of life bring them different environments and experiences during development, these young ladies may, in the years to come, teach us much regarding the still controversial subject of what heredity can do in influencing development,—and what environment.

IDENTICAL QUADRUPLETS*

ALFRED E. CLARKE†
Department of Genetics, University of Wisconsin

HUMAN twins of the identical or monozygotic type are arousing considerable interest at the present time. It appears worth while, therefore, to report the occurrence of a set of quadruplets who are probably monozygotic. Identical triplets have been reported by Clarke and Revell[1] and by Komai and Fukuoko,[6] but so far as the writer is aware no previous study of monozygotic quadruplets has been made.

A, *B*, *C*, and *D* are four baby girls born in Michigan on May 19, 1930. Their arrival was rather widely heralded by the daily papers at the time. According to the attending physician, they were monochorial, but unfortunately, the afterbirth was not preserved. Diagnosis of zygosity according to the state of the chorion has been questioned by some recent investigators, including Siemens,[10] v. Verschuer,[11] Curtius,[3] Newman,[9] and Komai and Fukuoko.[6] It has been shown that apparently identical twins may be born with separate chorions and that, very exceptionally, fraternal twins may possess only one chorion. However, if the diagnosis of the foetal membranes is correctly made and secondary fusions of adjacent chorions are not mistaken for the monochorial condition, the data secured thus far favor the view that monochorial twins are almost always monozygotic. This evidence, therefore, renders it probable that the quadruplets under consideration are identical, but it does not furnish conclusive proof that such is the case.

The babies, when seen by the writer early in January, 1931, appeared bright and healthy. Their weights were as follows:

	Weight at birth	*Wt. on Dec.* 25, 1930
A	4 lb. 8 oz.	15 lb. 8 oz.
B	3 lb. 5 oz.	13 lb. 0 oz.
C	4 lb. 4 oz.	14 lb. 12 oz.
D	3 lb. 0 oz.	10 lb. 0 oz.

The babies are listed in the order of their birth, *A* being the firstborn and *D* the youngest. The smallest baby, *D*, was cared for in an incubator after birth, and at eight months of age was still smaller than her sisters. However, according to the mother, *D* was beginning to gain weight more rapidly and the difference between her and the others was becoming less marked. The quadruplets are the only children in the family.

At eight months of age all four babies had light brown hair. While their hair was of the same color, it was noticeable that *D*'s hair was not as long as the others.' This probably accounts for *D*'s hair appearing less curly than that of her sisters, as shown in Frontispiece. In a more recent photograph *D's* hair is very curly. In color of eyes they show no difference. At eight months of age, according to their mother, the eyes of each were becoming darker. No differences were observed in the size and shape of the quadruplets' ears.

On March 11, 1931, all were stricken with influenza, being ill for about one week.

Palm prints and sole prints of the

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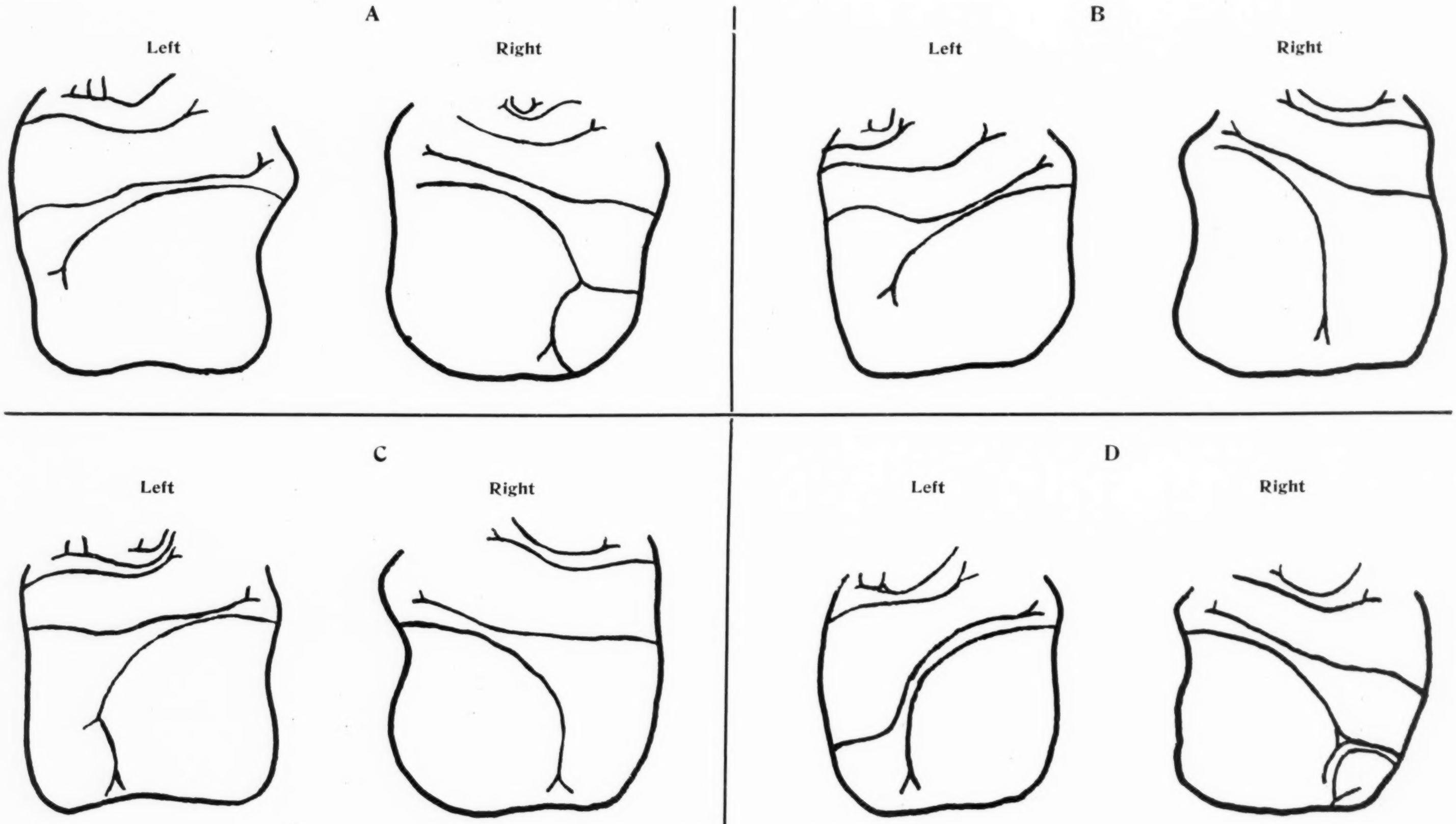
*Papers from the Department of Genetics, Agricultural Experiment Station, University of Wisconsin, No. 81. Published with the approval of the Director of the Station.

†The author wishes to express his thanks to Dr. L. J. Cole, Professor of Genetics at the University of Wisconsin, for the interest which he has shown in the study and for the many helpful suggestions he has made. He is also indebted to the American Genetic Association for a grant to defray travelling expenses.



PALM PRINT PATTERNS OF THE FOUR GIRLS

Figure 1

The cross-resemblance of palm patterns is striking. Thus the four right hands are more alike than are the right and left hands of any one individual. Detailed cross-similarities are also remarkable, as in the case of the right hands of *B* and *C*.

babies were obtained although considerable difficulty was experienced in securing satisfactory prints. The digital patterns are all loops. The palm pattern formulae, using the method of classification developed by Cummins et al,[2] are shown below.*

A study of the palm print formulae and the diagrams in Figure 1 shows that the left hand of each individual is more like the left hand of her sisters than it is like her own right hand. The right hands of *B* and *C* are remarkably similar, and the resemblance is fairly close between the right hands of *A* and *D*.

The sole patterns also exhibit evidences of direct cross-resemblance.

Cross-resemblance between identical twins has been previously described by Newman [7,8] and Komai [4,5] and between identical triplets by Clarke and Revell[1] and Komai and Fukuoko.[6] Close correspondence of patterns of the hands and feet of the same side is the type ot resemblance found in the most similar pairs of identical twins.

The mother expressed the opinion that the two larger babies, *A* and *C*, resemble one another very closely, while the two smaller ones, *B* and *D*, form another closely similar pair. A study of the friction skin patterns, however, fails to set off the children in this way, but strengthens the view that all four are derived from a single fertilized egg.

When one year old the babies were beginning to talk, and were able to say "bye-bye" and "pat-a-cake." *A*, *B*, and *C* were creeping and *D* was beginning to creep.

The close similarity of the four babies in friction skin patterns and other physical characters renders it probable that they are identical. It is hoped that additional data may be obtained as the children grow older.

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***Palm-Print Patterns of the Quadruplets.**

	Left		*Right*	
A	9/7.0.5".5'-t'-V/A^c.	O.O.M.D.	11.7.9.5'-tt'-V/L^u.	O.O.L.O.
B	7. 5".5".5'-t'-V/A^c.	O.O.O.L.	9.0.5".5'-t'-A^u.	O.O.M.M.
C	9/7.9.5".5'-tt'-V/L^u.	O.O.L.D.	9.0.5".5'-t'-A^u.	O.O.O.M.
D	9/7.0.5".3-t'-A^u.	O.O.O.D.	11.0.7.5'-tt'-V/L^u.	O.O.O.M.

The cross-resemblance of palm patterns is striking. Thus the four right hands are more alike than are the right hands of any one individual. Detailed cross-similarities are also remarkable, as in the case of the right hands of *B* and *C*.

Photographed by Wilson Popenoe.

TEOSINTE WILD IN GUATEMALA

Figure 2

Teosinte plants in a field at El Progreso, Guatemala. This plant is the nearest wild relative of maize. Its distribution in nature is thus a matter of considerable interest to those who are trying to discover the origin of that remarkable crop plant, one of America's great contributions to the agriculture of the world. Teosinte was reported in Guatemala in 1869, but has not been found there since that time. The plant is today rather widely distributed about the world. While it has some value as a forage crop it has never been grown to any extent for that purpose.

THE REDISCOVERY OF TEOSINTE IN GUATEMALA

G. N. Collins

U. S. Department of Agriculture

Photographed by Wilson Popenoe.

REGION WHERE TEOSINTE WAS DISCOVERED

Figure 3

View near Jutiapa, Guatemala, showing the type of country in which the wild teosinte was found, and a group of "assistant agricultured explorers" in the foreground. This is in the valley of the Rio de Paz, about 133 kilometers from Guatemala City. The altitude is about 3,300 feet. Teosinte was found mostly in old cornfields--ranging cattle apparently prevent its distribution in unfenced ground.

THE following letter recounts the recent discovery in Guatemala of teosinte, *Euchlaena mexicana* Schrad., a plant which has attracted special interest as the nearest relative of our cultivated maize.

Prior to this discovery Euchlaena had not been reported as occurring spontaneously outside of Mexico, although Guatemala was supposed to have been the source of cultivated teosinte.

Teosinte became known to agriculture in 1869 when Rossignon, Director of Gardens in Guatemala City, sent seed to Paris. The plants failed to mature seed, even in southern France, but aroused much interest. In 1877 teosinte seed was offered by Vilmorin and in 1878 it appeared in American seed catalogs. The source of the seed is not known. As the years passed and botanists who collected in Guatemala failed to find Euchlaena, the source of the seed sent by Rossignon came to be questioned.

Rossignon gave Santa Rosa in Southeastern Guatemala as the source of his seed, but an article by David Guzman states that Camilo Galvan supplied the seed Rossignon sent to Paris and that it came from Esclavos, a town not far from Santa Rosa.

In March, 1931, while with the Al-

lison V. Armour expedition, Mr. James Kempton and I visited these localities in company with Dr. Wilson Popenoe, but failed to find Euchlaena, either wild or cultivated. It was learned that Dr. N. I. Vavilov had recently visited that district on the same quest, and with the same negative result. The natives in these localities knew the name teosinte, but applied it to Tripsacum, a quite different grass. The locality where Euchlaena was finally discovered is in the same general region, but nearer the coast. All the localities mentioned in Dr. Popenoe's letter are in southern Guatemala near the border of El Salvador.

The finding of this important plant in so restricted a locality is another striking demonstration of the need for a detailed botanical exploration of Tropical America.

Since this letter is the original source of information regarding teosinte in Guatemala it is published without change, although it contains some irrelevant personal references. The text of Dr. Popenoe's letter follows:

SERVICIO TECNICO DE COOPERACION AGRICOLA

12 Calle Oriente No. 1—Guatemala, C. A.
January 1st, 1932.

DEAR MR. COLLINS:

I have sent a radiogram to Boston, asking Mr. Rowe to advise you as follows: "Teosinte abundant spontaneous apparently annual Jutiapa region herbarium specimens notes photographs follow." The herbarium specimens are packed and will be shipped by registered mail this week; the photographs will be sent as soon as they can be developed and printed; and here are the notes.

When Dr. N. I. Vavilov was here, just about a year ago, he spoke to Jorge Benitez, who has charge of our little experiment station at Antigua, regarding teosinte. I gather from Jorge that the Rossignon incident was mentioned. Jorge made some inquiries, after Vavilov had left here, in an endeavor to locate seed. It happened that Vicencio Lopez, a youth from El Progreso, Department of Jutiapa, had recently joined the staff of the Servicio Tecnico, and learned of the quest. He told Jorge he was familiar with teosinte; that it grew wild near his home; and that he would get seed.

He did, and we sent the seed to you. When your letter of 7 December arrived, acknowledging receipt of the seed and confirming our belief that it is the thing you are after, we decided to look into the matter more fully; but waited to talk with Vicencio before so doing. When at Panajachel a few days ago, I had opportunity to get further information from him, also a letter to his brother, who lives at the Lopez home in Progreso. Armed with this letter, Dorothy and I started out yesterday morning in Mr. Armour's Ford.

We followed the road on which you, Jim, Bates, and myself came back from the Rio de los Esclavos. We passed through Cuajiniquilapa, and there was the little girl, hanging out of the window of the hotel, with a wistful look in her eye. We crossed the Rio de los Esclavos, passed the point at which we turned back last spring, and shortly afterward began climbing up into the hills. We left the watershed of the Rio de los Esclavos and after a bit of travelling, came down out of the hills onto the Jutiapa plain, which drains into the Rio de Paz.

We passed through Jutiapa, and went on 12 kilometers farther, to El Progreso, a small town 133 kilometers from Guatemala City by the road we followed—which, by the way, is the present main road from Guatemala to El Salvador. We found Vicencio's brother, Benjamin, in a little hut, some hundreds of yards beyond the edge of the town; and after telling him our

mission, he led us across the narrow valley in front of his place, and up the slope a few hundred feet to an abandoned cornfield, where we saw teosinte in abundance—now dry, and most of the seed fallen, but plenty of it left to make collecting easy. It was at this spot that we took the series of photographs we hope to send you shortly, and collected the dry plants which are being sent you in this mail.

The altitude of this spot, as closely as we could determine it with the aneroid barometer, is 3,300 feet. The soil is a heavy residual clay, black near the surface, and light brown to chocolate brown below.

We talked with Benjamin Lopez regarding the occurrence of teosinte in this general region; we talked with some of his neighbors; and we started back toward Jutiapa, observing teosinte at several places along the road, growing always in old cornfields—"rastrojos" as they are termed locally. This morning, on starting homeward from Jutiapa, we again watched the roadsides for teosinte, and found it in a number of spots until we got to the Quebrada Anonal—one of the confluents of the Rio de Paz—after which we saw it no more, nor were we able to find anyone, in the houses along the way, who believed that it grew in the neighborhood.

Summing up the results of the trip, we can say:

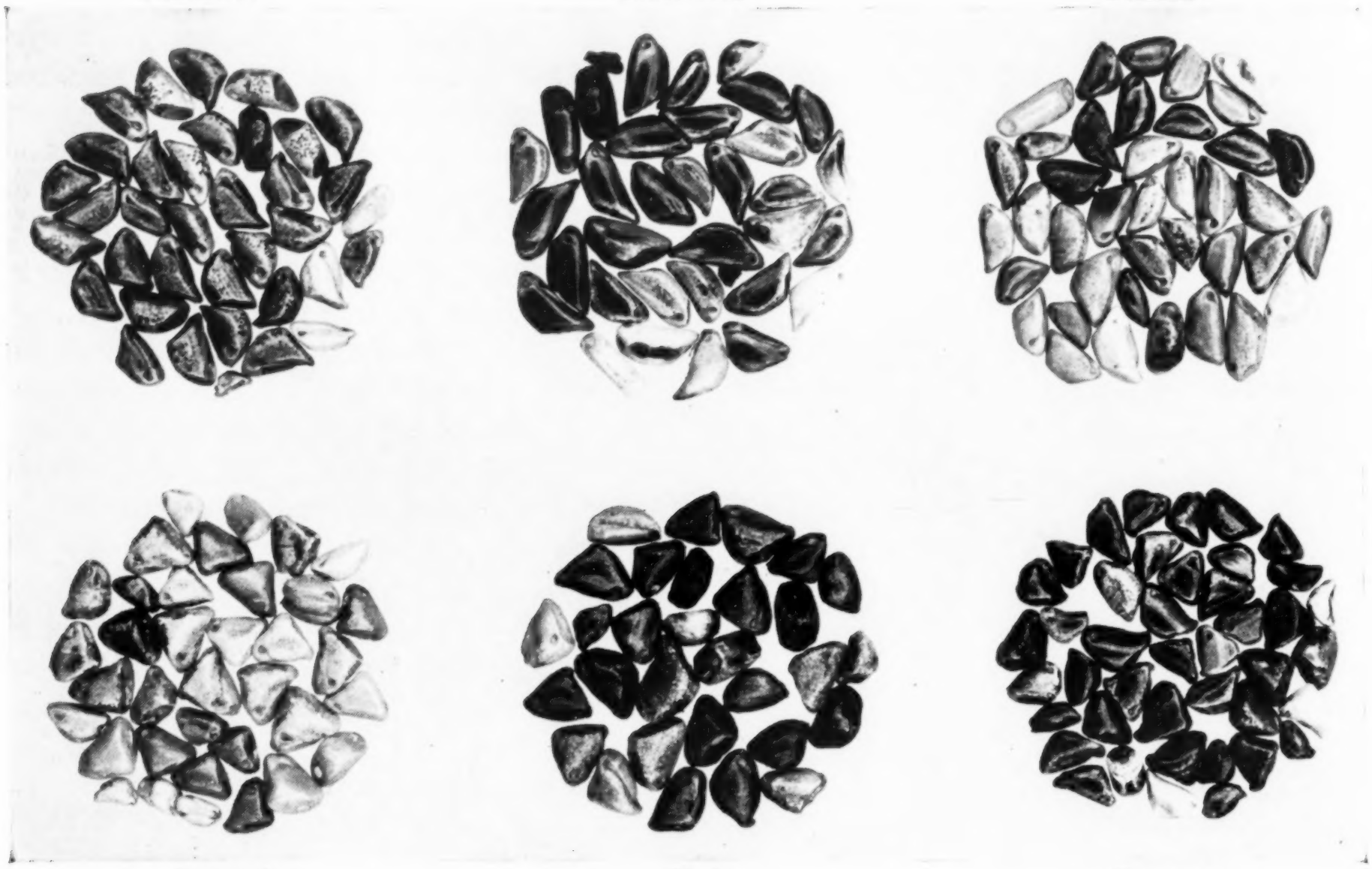
We have personally seen teosinte along the roadside, about ten miles on each side of Jutiapa. Vicencio Lopez says he has seen it northward as far as the Lago de Retana, and at Asunción Mita. Don Julio Drago of Jutiapa says he has seen it very abundantly on the road between Jutiapa and Jalpatagua. We have other accounts of its occurrence in the same general region. But it is to be noted that we found it *only* in the region drained by the Rio de Paz. Once we got across the divide onto the watershed of the Rio de los Esclavos we lost it completely.

By one of those happy coincidences on which Dr. Fairchild loves to dwell, Don Jorge Garcia Salas came in just as I was starting this letter, and told me he had received a quantity of teosinte seed from Don José Marcucci, who lives at Moyuta, about half way between Jutiapa and the Pacific Ocean. Don Jorge says that he has personally seen teosinte growing very abundantly on the plain between Moyuta and El Molino, a small place on the headwaters of the Rio de los Esclavos. This is the first reliable account we have had, which took this plant out of the basin of the Rio de Paz.

As regards the altitudinal range we cannot say much; but we think it safe to estimate that it goes at least as low as 2,500 feet and as high as 3,500. How much these limits will be extended by later investigations remains to be seen.

The plant was not seen by us in any but a dry state. It is said to come up with the rains, which commence about May or June, and to mature its seed at the end of the rainy season, which is about the end of November. As regards your question concerning the annual or perennial nature of the plant, Vicencio told us, the last time we talked with him, that it is perennial; but his brother, Benjamin, says Vicencio has forgotten; and from the appearance of the root system we feel confident it is an annual. As far as we saw, it is not planted; but in talking with natives of the region, we got several vague statements to the effect that it is *sometimes* planted, though no specific cases were mentioned. The people say it just comes up in the "rastrojos"; that it is excellent fodder for cattle, and is sometimes cut for this purpose; and that so far as they know, it has always been in the region. We heard nothing to suggest that it had been introduced.

The word "rastrojo" is used to signify a cornfield which has made its crop, and on which new planting has not yet been carried out. So far as we saw, the occurrence of teosinte (which



SEED OF TEOSINTE

Figure 4

Seed of teosinte from the locations indicated, showing the range of variation in form. The newly discovered teosinte from Guatemala resembles the Florida form more closely than does the Mexican (lower row), probably because the Florida form originated from teosinte sent from Guatemala to France in 1869, and sent from there to America, about 1877.

seems to be called, by the way, "teosinte," "teosinta," and "teosinto") is practically limited to these old cornfields. A rather unusually intelligent old fellow with whom we talked pointed out that teosinte springs up in any fenced area; and it then struck us forcibly that it would be hard for the plant to grow elsewhere, since cattle roam all unfenced lands in this area, and teosinte is relished by cattle.

There is a belief locally, recounted by Benjamin Lopez, to the effect that teosinte, if planted alongside maize, becomes maize, in the third generation. This same belief was mentioned by Don Jorge Garcia Salas this afternoon; and he states that a friend of his actually made the test, and exhibited, some years ago, ears which had been obtained in this way.

So much for our story. Going back to your letter of 4 May last, you recount that one Camilo Galvan, living in Esclavos, brought plants of teosinte from the mountains, grew them for two years, and sent a communication and seed to the Sociedad Economica, where Rossignon finally picked up the seed and sent it on to France. Don Jorge Garcia Salas knows some of the old timers here who may have files of the proceedings of this society, and tomorrow he has promised to begin a search for the information requested in your letter. I do not know that anything will come of this; but in the light of what we now know regarding the presence of teosinte in the Department of Jutiapa, it is not difficult to believe that Camilo Galvan brought seed to Esclavos from some point a few miles east or southeast, and that old Rossignon should have copped onto the bottle when he saw it at the Sociedad Economica. It is still difficult for us to

believe, however, that this seed produced perennial plants.

We shall send you a further quantity of seed—some of our own collection, and some from Don Jorge Garcia Salas—hoping that you will learn more from growing it than we can tell you. And if you will let us know what further data we can get you here, we shall do our best. Our one regret is that we had not dropped onto this recent lead at the time you and Jim were here; for we know that you would have found an even greater thrill in the trip to Jutiapa than have Dorothy and I though we have enjoyed it immensely. Perhaps you can come down again.

With best regards from both of us,

Yours very sincerely,

WILSON POPENOE.

"Oxygen and Everest"—Another Instance of Sense-Differences

FOR many months the correspondence columns of the British scientific weekly, *Nature,* have been spiced with widely divergent views regarding the value of oxygen respirators for high mountain climbing. One school of thought, favoring the use of oxygen apparatus, has been opposed by equally competent authorities who could see no value in such mechanical contrivances, the weight and bulk of which, it was argued, more than offset their value to the climber. The latest contribution to this controversy, by Dr. Yandell Henderson, of Yale University, brings out an interesting point that unexpectedly places this controversy in the field of inherited sense differences, which has recently been discussed in this Journal.

Dr. Henderson points out that there are great differences in the ability of different people to acclimatize to high altitudes. Acclimatization is a matter of altering the amount of acid and alkali in the blood so that the balance remains the same as at lower levels, but with the percentage amounts much decreased. For a person capable of becoming thus acclimated, the oxygen mask, by upsetting this delicate acid-alkali balance in the blood, produces acute distress on the slightest exertion. For the type that does not acclimatize readily, the oxygen-alkali percentage never is reduced to a "normal" high altitude level. For such individuals the oxygen mask is a God-send, and affords amazing relief when exertion is undertaken at high altitudes.

Thus this controversy has as a basis a definite physiological, possibly genetic, difference. Those who can see no value in the oxygen apparatus take this view because to them it is worse than useless. The disagreement, as Professor Henderson says, is not in their minds, but in their respiratory centers. "How can a man of either opinion accept the other when his own is to him as obvious as breathing? The whole science of respiratory physiology would today be different from what it is if its author, Dr. Haldane, had not happened to have had a respiratory center of the type that is most completely controlled by carbon dioxide, yet acclimatizes fairly easily. Those who disagree with him on such matters as acclimatization, do so, not so much because they think differently, as because they breathe differently."

Thus we are again reminded that political equality and biological equality are two distinct things. The former is an ideal of government; we are equal units in the eyes of the law even though one of us is an acclimatizer and one is not. The paradox of "different equals" offers few difficulties until we begin to make unwarranted extensions of the principle, until we try to apply it where the evidence of our senses tells us it does not apply. Neither legislation nor education can make a "non-acclimatizer" into an "acclimatizer," a "non-taster" into a "taster," or, most difficult of all, a "non-thinker" into a "thinker." We

tacitly assume that such miracles can be accomplished; we spend large sums trying to bring them about, and are amazed when the leopard's spots stay very much the same, in spite of our earnest efforts to alter the design to one that we believe to be more "suitable"!

EUGENICS CONGRESS PROGRAM

THE Third International Congress of Eugenics, to be held August 21-23, at The American Museum of Natural History, New York City, has issued the following preliminary program:

NOTE: *Papers preceded by asterisk * will probably be read by title.*

Sunday, August 21, 1932

Excursion to Cold Spring Harbor. Leave from Pennsylvania Station at 9:11 A. M., D.S.T.

Monday, August 22, 1932

8:30 to 10:30 A. M.

Registration.

GENERAL SESSION

10:45 to 11:30 A. M.

IMMIGRATION CONTROL.

Main paper by *D. F. Kamos*, Habana.
Discussion by *H. H. Laughlin.*
Discussion from the floor.

MEASURES TO ENCOURAGE THE FERTILITY OF THE GIFTED.

Leading paper by *Dr. J. Sanders*, Rotterdam.
**Dr. George Schreiber, Dr. Renato Kehl.*
Franco Savorgnan. "Married Fecundity in the Aristocracy."
Discussion from the floor.

11:30 A. M. to 12:15 P. M.

REDUCTION IN FECUNDITY OF THE SOCIALLY INADEQUATE, INCLUDING STERILIZATION AND CONTRACEPTIVE ADVICE.

Main paper by *Sir Bernard Mallet*, London. Leading discussion by *E. S. Gosney* and *Dr. T. R. Robie* on "Selective Sterilization for Race Culture." *J. Sanders* will also discuss. Discussion from the floor.

12:30 to 1:30 P. M.

Luncheon.

1:15 P. M.

Business meeting of the International Federation of Eugenic Organizations, at the Museum.

SECTIONS

I. RACE DIFFERENCES IN RELATION TO EUGENICS.

Taeuber, Mrs. Irene Barnes. Assortative Mating for Color in American Negro.
Holmes, S. J. The Effect of Migration on the Natural Increase of the Negro.
Plecker, W. A. Virginia's Effort to Preserve Racial Integrity.
Rosinski, Boleslaw. The American People of Polish Origin in Texas.
Wallis, Ruth Sawtelle. Harmonic Types among Western European Crania.
**Boldrini, Marcello.* The Unification of the Anthropological Type of Italians and its Eugenic Effects.
**Govaerts, A.* Characteristics of the Belgian Population.
**DuPont, A. F.* Racial and Ethnological Difference between Northern and Southern French.
**Cipriani, Iddio.* The Mental Possibilities of Negroes.
**Pessler, Wilhelm.* Volkstumsverbreitung und ihre Ursachen.

II. MEASUREMENT OF HUMAN TRAITS.

Stanton, Hazel M. Stability of the Seashore Measures of Musical Talent, as shown by Retests.
Frassetto, Fabio. Project for a committee on Standardization, Fertility and Constitution.
Gates, R. R. Plan for Obtaining an International Standard Technique in Physical Anthropology.
Post, R. H. Standardizing Measurements of the Living.
Davenport, C. B. On the Need of Checking in Anthropometry.
Downey, June. Handwriting of Intraverts and Extraverts. (Lantern).
**Bunak, V.* On the principles of the Anthroposcopical methodology.

III. VARIATIONS, BIRTH RATE AND FECUNDITY, AND MATE SELECTION.

Graves, William W. A Note on Inherited Variations and Fitness Problems: I. The Types of Scapulae.
Danforth, C. H. Family Size as a Factor in Human Selection.

Cobb, Margaret V. Evidence of the Rapidly Decreasing Birth Rate in Families in which Highly Intelligent Children Occur.
McGee, Mrs. Anita N. Merging of Ancestral Lines.
Crampton, C. W. Aristogenics.
Hodson, Mrs. C. B. S. The Results of Contra-Selection in England: A survey of available statistics.
Grove, Chas. C. The Inadequacy of Census Data for Certain Eugenic Investigations.
**Freudenberg, Karl.* die neusten Wandlungen der Fruchtbarkeit in Berlin nach sozialen Verhaetnisse.

6:30 P. M.

Dinner will be served at the American Museum of Natural History.

GENERAL ASSEMBLY

8:00 P. M.

Introductory remarks by the President of the International Federation of Eugenic Organizations.
Message of *Leonard Darwin*, to be read by *R. A. Fisher*, Rothamsted Experimental Station, England.
Address by *Henry Fairfield Osborn*, "Birth Selection vs. Birth Control."
John Alfred Mjoen, Oslo: "Leading Principles and Guiding Lines for a new Population Politic—a First Step.

9:30 P. M.

Reception at the American Museum of Natural History.

Tuesday, August 23, 1932

GENERAL SESSION

9:30 to 10:30 A. M.

EUGENICS AND EDUCATION; also EDUCATION IN EUGENICS.

Leading paper by *G. P. Frets*, Rotterdam. Leading discussion by *C. C. Little*. Discussion by *Dr. Madge T. Macklin*, "The Need of a Course in Genetics in the Medical Curriculum"; *O. W. Caldwell:* "Some Aspects of Instruction in Eugenics"; *W. Carson Ryan:* "Special Innate Capacities in the Indians." Discussion from the floor.

10:30 to 11:30 A. M.

MARRIAGE ADVICE.

Main paper by *Paul Popenoe:* "Marriage Counselling."
**Fetscher, Prof. Dr. R.* Eheberatung in Deutschland.
Formal Discussion by *J. A. Mjoen*. Discussion from the floor.

11.30 A. M. to 12:30 P. M.

EUGENICS AND WAR.

Main paper by *C. Gini*, Rome. Discussion introduced by *Harrison Hunt:* "Is War Dysgenic?" Discussion from the floor.

12:30 to 1:30 P. M.

Luncheon.

SECTIONS

1:30 to 4:30 P. M.

IV. THE SOCIALLY INADEQUATE IN RELATION TO EUGENICS.

Kemp, Tage. A Study of the Causes of Prostitution, especially concerning Hereditary Factors.
Myerson, Abraham. The Heredity of Various Groups of the Feeble-Minded.
Powdermaker, Florence. Considerations on the Social Factors in Mental Development.
Hackbusch, Florentine. Pennsylvania's Problem in Eradicating Foci of Mental Defect.
Landman, J. H. Eugenic, Cacogenic and Socially Inadequate Tendencies in our Population.
**Ferreri, Prof. Guilo.* Il Sordomutismo nel Campo Eugenetico e Sociale.
Pollock, Horatio M., Benjamin Malzberg and *R. G. Fuller:* Is Heredity a Causative Factor in the Manic-Depressive Psychoses?
**Antonini, Giuseppe.* La Criminalita in Rapporto All' Eugenics Sociale.
De Porte, J. V. Murder in the State of New York.

V. PHYSIOLOGY OF REPRODUCTION.

Rowe, Allen W. and associates: Symposium on Human Infertility (Lantern).
1. Medical Aspects by *C. H. Lawrence.*
2. Gynecological Aspects by *Dr. S. R. Meaker.*
3. Endocrine Aspects by *Dr. A. W. Rowe.*
4. Urological Aspects by *Dr. S. N. Vose.*

Guyer, M. F. Ovarian and Pituitary Modifications resulting from Serum-Induced Sterility.
**Bluhm, Dr. Agnes.* Uber Beeinflussung des Zahlenverhaltnisses der Geschlechter durch Behandlung des Weibchens.

VI. SANITATION AND DISEASE IN RELATION TO EUGENICS.

Campbell, C. G. The Physical Factors in Race Survival.
Herman, Charles. Selective Elimination as a factor in Increasing the Immunity of Population.
Sterling, E. Blanche. Child Hygiene in Human Ecology.

VII. GEOGRAPHY AND HISTORY IN RELATION TO EUGENICS.

Lorimer, F. Types of Data Available for Eugenic Research in the United States.
Perkins, H. F. Contributory Factors in Eugenics in a Rural State.

Key, Wilhelmine E. Race and Family in the History of American Institutions.

Wheeler, L. R. Heredity and Environment—their Relative Rôles in the Development of East Tennessee Mountain Children.

VIII. Genetics and General.

Richards, M. H. and R. M. Balyeat. The Inheritance of Allergy with Special Reference to Migraine.

Hutt, F. B. Sex Differences in the Expression of Autosomal Genes affecting Human Dentition.

Hurst, C. C. Genetics of the Human Mind.

Frets, G. P. Heredity in Psychoses.

Johnson, Roswell H. Inheritance of Mental Test Abilities.

Binder, R. M. The Soong Family—an Example of Great Ability in the Common Man.

Gini, Corrado. Remarks on the Explanation of Heterosis.

Artom, Cesare. Allo e Antropoliploidismo negli studi di Genetica.

Steggerda, M. Some results of a Family History Study.

Muller, Dr. H. J. The Dominance of Economics over Eugenics.

Cook, R. C. Is Eugenics Half-Baked?

Ehrenfried, Dr. Albert. Hereditary Deforming Chondrodysplasia (Lantern slides).

In addition to the formal program, the Exhibit of the Congress will be open during the month of September, at the American Museum of National History.

Membership dues in the Congress are $5.00. Application should be made to Dr. H. H. Laughlin, Cold Spring Harbor, Long Island, New York.

Studies in Human Fertility

STUDIES ZUR FERTILITAT, *by* G. L. Moench. Pp. 4 + 143. Ferdinand Enke Verlag, Stuttgart. 1931.

An interesting discussion is given of human sterility based on clinical and laboratory observations obtained from 141 marriages. These include 37 cases of normal fertility, 63 definitely sterile cases and 41 which exhibited various grades of fertility.

The first part of the report is devoted to discussion of the various grades of fertility, the possible influence of diet upon sterility, physical variations among women, and certain obscure causes of sterility.

The second part of the report is concerned largely with microscopic studies upon the seminal fluids and extensive microscopic studies of the spermatozoa. Extensive measurements were obtained upon the spermatozoa in all but 15 of the 141 cases. The data are presented in various tabulations and graphs throughout the text, and a frequency tabulation for the measurements of each individual case is conveniently placed in the appendix. There is an interesting double page figure showing 50 different morphological forms of spermatozoa, and a full page figure illustrating the microdissection of the spermatozoön. The report ends with a bibliography of 216 numbers and a brief clinical report on each of the 141 cases considered.

This publication will be of greatest interest to those who are interested in the physical variations of spermatozoa and the possible relation of these to fertility. The listing of the frequency distributions for the measurements of each individual case, together with the brief clinical description, makes it possible for the reader to pick out individual cases and make such comparisons as he desires.

H. C. McPhee.
U. S. Department of Agriculture.

INHERITED (?) DWARFISM IN THE FOWL

A Preliminary Report of An Apparently Hereditary Condition of Dwarfism in the Rhode Island Red Fowl, Suggesting Cretinism

ROY L. MAYHEW AND CHARLES W. UPP
Louisiana Agricultural Experiment Station

THE chickens which developed the conditions described in this report appeared among those reared by the senior author while he was carrying on a study of coccidiosis at Louisiana State University. The eggs from which all these chickens were hatched were obtained from his flock of single comb Rhode Island Red hens, incubator hatched, and all lots reared under as near the same conditions of temperature, feed, etc., as possible, except the one in which numbers 488 and 495 appeared. For a further description of the details of management the reader is referred to Mayhew[12].

Chicks which posses these unusual characteristics do not show them, at least to any marked degree, when hatched, but by the age of about two weeks it is usually possible to separate them from their normal sibs. Generally the first point to be noted is the relative shortness of the legs, the outer toes usually begin to turn more or less outward and backward and the body is carried in a nearly horizontal position. The peculiarities of the head and beak do not develop to a marked degree until sometime later, although they may be detected at three to four weeks. The head as well as other characteristics vary much in the degree of their development in different individuals.

Most of these chickens have not lived to be very old, and many of them did not seem to have much resistance to the common diseases. Some have died with colds and bronchitis, some became paralyzed, while one died suddenly without any apparent symptoms of disease. Many of them have been isolated shortly after detection and have been given special care. No. 23, it will be noted, survived the longest and was 83 weeks old when she died, after having been isolated at about 5 or 6 weeks of age, and kept on a wire floor and under screen all her life. Thus on account of its effect on viability the character might be considered a semi-lethal.

Discussion of Literature

Numerous inherent dwarf forms of various types are known in the plant kingdom. Relatively few cases of dwarfism have been reported as occurring among the higher animals and the inheritance of some of these is not known.

Sollas[16, 17] described a dwarf form which appeared in a strain of guinea pigs. This form was remarkable in the shortness of the body and limbs and the unusual form of the head. This dwarfing proved to be inherited as a simple recessive. A few dwarf guinea pigs that lived were sterile and were about one-half normal size when mature. Snell[15] discovered a simple recessive type of dwarfism in mice in which the proportions of the animal as a whole were those of a normal adult. These animals were somewhat subnormal in vigor and were entirely sterile. Mature dwarfs were only about one-fourth the weight of their normal brothers and sisters. Smith and MacDowell[14] have proven this type of dwarfism to be due to a deficiency of the anterior lobe of the pituitary. East[7] mentions three main types of human drawfs. Cretinism, the type in which the thyroid does not function, is inherited as a simple recessive. This type of human dwarfism seems to resemble the dwarfism in fowls which is discussed in this paper. Craft and Orr[3] described a certain

Hereford calf in which the thyroids, parathyroids, and pituitary body were markedly deficient. The inheritance of the condition was not given. The inheritance of short-leggedness has been reported in fowls by Dunn and Landauer[6, 10], and by Landauer[9]; in sheep and dogs by Plattner[13] and Wreidt[18]; and in cattle by Crew[4, 5], Lush[11], Wreidt[18] and others. Aside from the "bulldog" calves[4, 5, 18] these types appear normal in respects other than extremely short legs. They are thus distinctly different from the dwarfism under consideration in this paper.

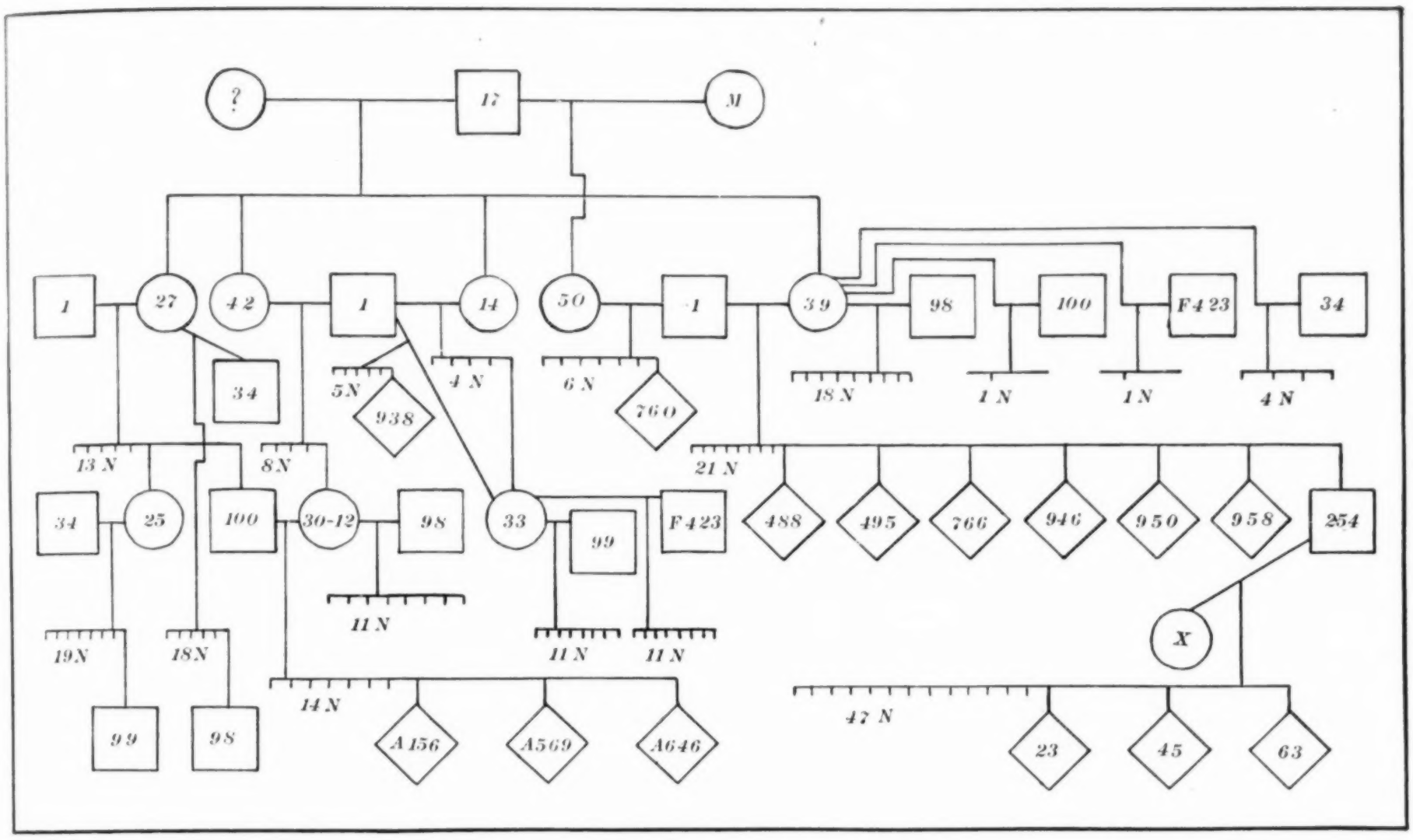
Two miniature individuals have occurred in the Buff Plymouth Rock flock of the Poultry Department, Iowa Agricultural Experiment Station (Waters[20]). These birds appear to be normally proportioned, but are smaller than the average Buff Rock. Information as to whether or not this is an inherited condition is not available. Byerly[1] in work with the recessive lethal character "stickiness," noted the appearance of five chicks which had all of the appendicular bones much shortened. It is not stated as to whether or not these individuals were retarded in growth. This author[2] states, "The relationship, if any, between stickiness and thyrogenous dwarfism remains to be established." Landauer[8] has described a condition of thyrogenous dwarfism (*Myxoedema infantilis*) occurring in Rhode Island Red fowls. It has also been observed by Warren[19] in the Rhode Island Red flock of the Kansas Agricultural Experiment Station. Landauer presented no data as to the inheritance of this form of dwarfism. From such observations as we have been able to make to date, the condition reported in this paper appears to be the same as that reported by Landauer and Warren.

General Description

In general appearance these chickens resemble bantams somewhat, but on closer observation several differences are noted. The legs are much shorter in proportion to the body size as compared to the normal fowl, the outer toes turn more or less outward and backward, the beak is somewhat parrot-like, the upper being bent downward while the lower is nearly straight, the head is much wider in the region of the eyes than is the normal, and the eyes have a more or less puffy ring surrounding them. Measurements indicate that the depth of the body is less than in the normal and the base of the tail is carried about on a level with the middle of the body while in the normal chicken it is lower. The tail feathers also are directed backward and downward while in the normal they are more upright in position. There is considerable variation in the degree with which these various characteristics develop in different individuals and in the rate at which they develop. They are cheerful and sociable little chickens, and appear to be normal in activity in a general way. It has been possible to rear but one, No. 23, a female, to the age of sexual maturity. This one, while she had much the appearance of a female, yet never laid an egg nor showed any other characteristics of either male or female. The sex of but five have been determined by postmortems. Four of these were females, and the other was a male.

Pedigree Records

Eleven of the eighteen individuals showing these characteristics have been pedigree hatched and the dam and sire both known. An examination of the pedigree records shows that these have been hatched from four of the 44 hens that have constituted the flock during the period of the observation. Three of the seven male birds used in the various matings during this time have been the sires of dwarfs. The relationships of these various males and females are shown in Figure 5. An examination of this diagram shows that the first male concerned in the production of dwarfs is No. 17 which was obtained, along with a hen, designated *M* in the chart



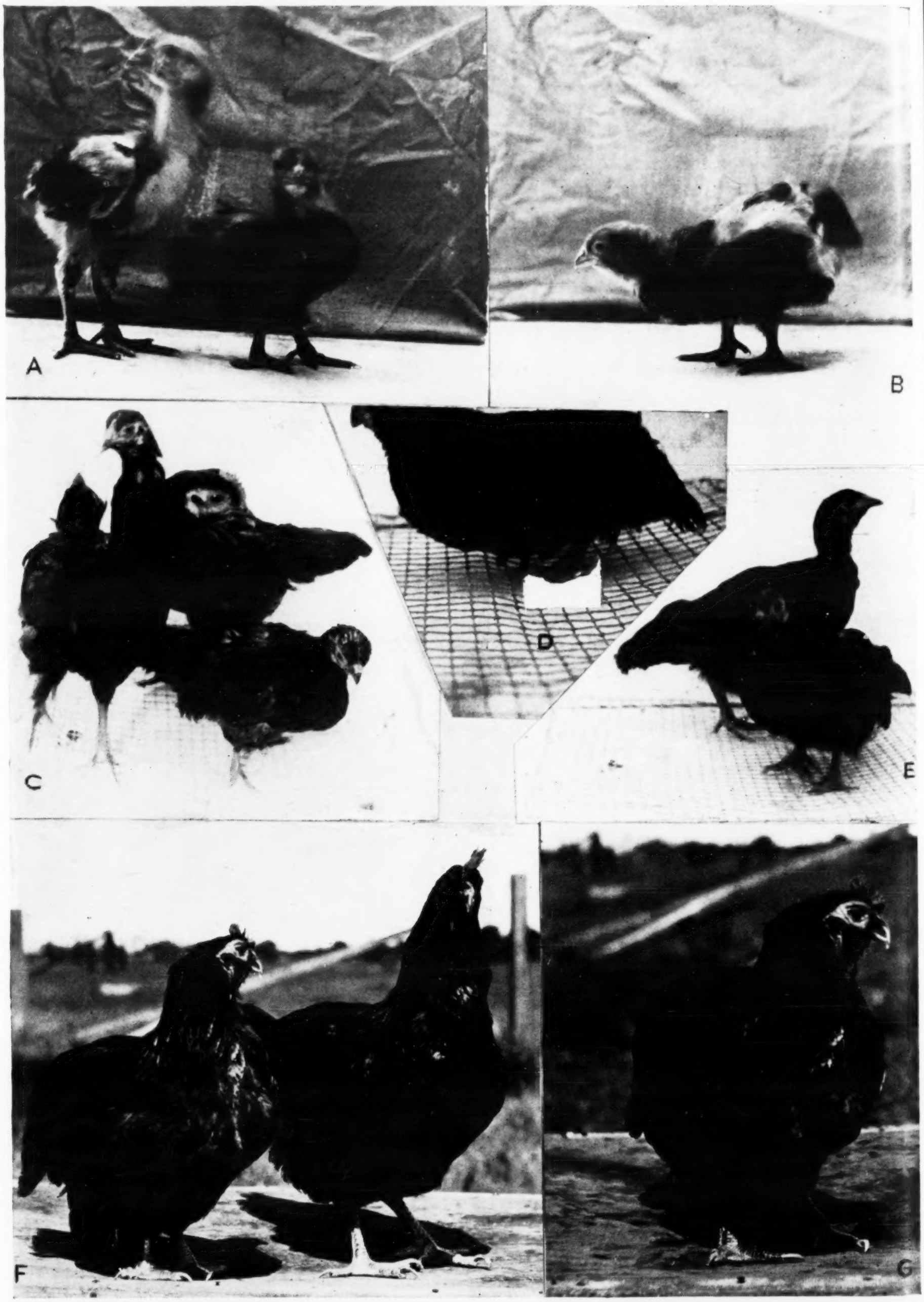
RELATIONSHIP OF DWARFS

Figure 5

Pedigree chart showing the relationships of the dwarfs and normal chickens and their parents. Explanation of symbols. O=female; □=male; Diamond = Dwarf; *X*=pen of 13 hens in Louisiana Egg Laying Contest including 30-12 who has since produced three dwarfs as indicated in the left portion of the chart.

(which became the mother of No. 50), from a breeder in Massachusetts in the fall of 1927. This male became the sire of hens No. 39, 50, 42, and 14. The mother of No. 33 was No. 14, and it may be observed that when No. 33 is mated to her sire she produced one dwarf, but none when mated with male No. 99 and No. F-423, although 11 chickens were reared from each. In the fall of 1928 a cockerel, No. 1, was obtained from a breeder near Baton Rouge, who had obtained the dam and sire from a breeder in Mississippi. It will be observed that in the matings of this male with No. 39, six dwarfs were obtained, and with No. 50 one dwarf was obtained. In the fall of 1930 a second cockerel, No. 34, was obtained from the same Massachusetts breeder from whom No. 17 was obtained, and another, No. F-423 from Texas A. & M. College. Two separate pens were maintained and no dwarfs appeared in either from any hens of the flock while mated with these males. It will be noted that No. 39 was mated to one of these males during the first part of the season and to the other during the latter part. Although the numbers that were hatched and that lived beyond the third week from No. 39 are small in each case as noted, no dwarfs appeared. No. 33 produced 11 chickens which lived beyond the third week while mated with No. F-423 and none of them developed dwarf characteristics.

During the same season the senior author's pen of 13 hens in the Louisiana Egg Laying Contest, designated *X* in Figure 5, were mated to a cockerel sired by No. 1 and whose dam was No. 39. In one unpedigreed lot from this mating three dwarfs appeared. In this pen was No. 30-12, a daughter of No. 42 whose sire was No. 17, and she was herself sired by No. 1. This hen has since produced three dwarfs while mated with male No. 100 whose sire was also No. 1.



DWARF AND RELATED NORMAL CHICKENS

Figure 6

A—No. A569, dwarf, right, and No. A567, normal, age 4 weeks. *B*—another view of A569. *C*—dwarf lower right, normal male lower left, and normal female in the background, all the same age. *D*—dwarf with very abnormal feet, the background has been cut away to show how the toes curve backwards. *F*—Dwarf No. 23 left, age 14 months, weight 1,260 grams. The normal hen, right, is not quite erect, but is the same age, has the same sire, and weighs 2,300 grams. *G*—Dwarf No. 23 in a somewhat different position, and showing the very abnormal head and nearly normal feet.

This is especially interesting since 30-12 was mated with No. 100 in the early spring, producing dwarf No. A-156. No. 100 was then replaced with No. 98, who died after 11 normal chickens were hatched from 30-12. No. 100 was then returned to the pen with the result that two more dwarfs were produced. No. 98 is evidently not a carrier since he produced only normal chickens, 18 in number, while mated with No. 39 as shown in the upper right hand portion of Figure 5.

Two other males, Nos. 98 and 99, whose pedigrees are shown in the diagram, have been used in the season of 1930-31, and no dwarfs have appeared although all three of the dwarf-producing females have been mated with them as indicated, with a goodly number of chickens produced in each instance.

Hatching Records

An examination of the hatching records of all hens in the flock during the period of the observation yields certain data which may be summarized as follows:

There have been a total of 44 hens from which chickens have been hatched between February, 1929, and July, 1931, or covering three hatching seasons.

A total of 1,094 chicks have been hatched from these hens.

A total of 229 chicks have been hatched from all hens mated with dwarf-producing males.

The available data show that 55 chicks died in the shell, of the eggs set from hens mated with dwarf-producing males while from hens mated with other males 244 died in the shell. Data on this point are incomplete because fertility records were not kept on all lots. Also records as to the total number of eggs set were not kept in all lots.

The principal data with reference to the dwarf-producing females is given in Table I.*

The total number of normal chickens hatched and living beyond the third week by these females mated with dwarf-producing males is thus found to be 46, while 11 pedigreed dwarfs have appeared.

The total number of deaths from one to three weeks of age is nine when these hens were mated with dwarf-producing males and 11 from non-dwarf-producing males.

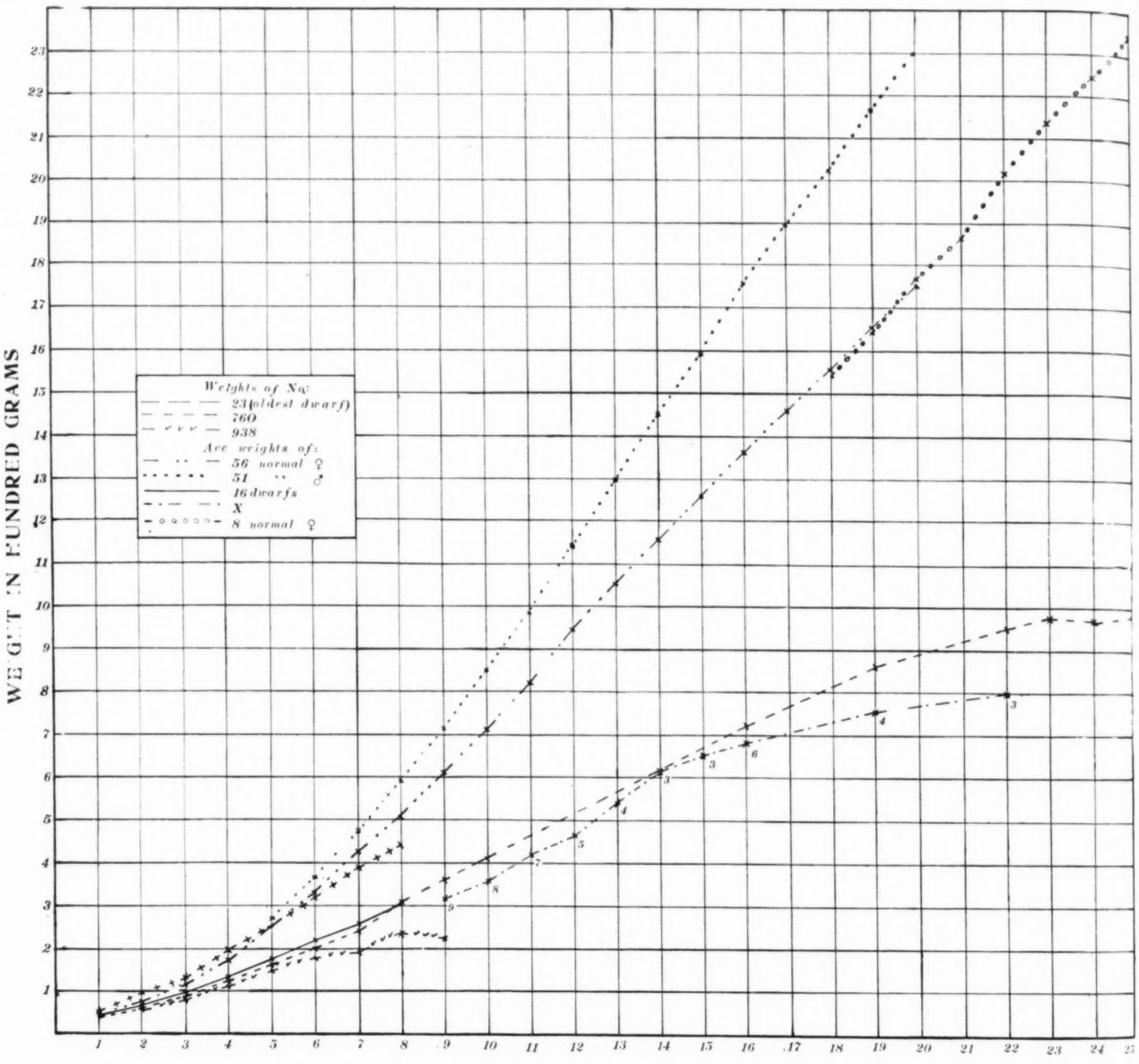
Egg Production and Egg Weight Records

An examination of the egg production records of the dwarf-producing hens shows that No. 39 laid 254 and No. 33 laid 204 eggs in their pullet years and No. 50 laid 139 in the first nine months of her pullet year. No. 30-12 has a record of 209 eggs in her pullet year. The mothers of the dwarf-producing males have pullet year records as follows: No. 1, 186 eggs in eight months; No. 17, 206 eggs, and No. 100, 268 eggs. The approximate weights of the eggs laid by the dwarf-producing females is as follows: No. 39, 24 oz. per dozen; No. 33, 22 oz. per dozen; and 30-12, 24 oz. per dozen. Egg weights on No. 50 are not available since none were kept during the first season of these observations. Thus it is seen

* **TABLE I. Progeny Records of Dwarf-Producing Females Mated to Normal-Producing and to Dwarf-Producing Males.**

	Mated to	Total Hatched	No. Living Beyond 3rd Week	No. Normal	No. Dwarf	Deaths 1-3 Weeks
33	D	6	6	5	1	0
	N	28	22	22	0	6
39	D	33	27	21	6	6
	N	30	25	25	0	5
50	D	8	7	6	1	0
	N	5	5	5	0	0
30-12	D	20	11	14	3	3
	N	11	11	11	0	0

D=Dwarf-producing males; N=Normal-producing males.



GROWTH CURVES OF DWARFS AND NORMAL CHICKENS

Figure 7

No. 23 was the oldest dwarf so far obtained. She lived to be 83 weeks old and attained her maximum weight of 1,300 grams at the age of 61 weeks. No. 760 was one of the heavier and No. 938 was one of the lighter weight dwarfs. The curve designated *X* represented the average weights of such dwarfs as were living and weighed at those particular weeks. The number of individuals entering into each average is indicated on the curve. The eight normal females designated by circles and dashes were kept under the same general conditions as the dwarfs, and were from the same lot as No. 23.

that the fact that these hens were apparently carriers of this unusual characteristic does not seem to have influenced in any way their production qualities.

Weights of Dwarfs

The chickens were weighed weekly as a matter of routine in connection with the coccidiosis experiments. Figure 7 shows these data graphically. The observations are recorded in detail in Table II. Weekly weights are available of 16 of the dwarfs (of unknown sex) and their averages are plotted in Figure 7 in comparison with 56 normal females and 51 normal males which were reared under the same conditions. No weights of No. 488 and 495 were kept as they were

among the young chickens reared at the senior author's home. Beyond the eighth week weights were not taken regularly but such as were kept are given and the curve designated *X*. It will be noted that the average of the dwarfs runs lower than that of the normal females. The weights of one of the heaviest and one of the lightest dwarfs are also plotted. It will be noted that the heaviest dwarf is higher than the average of the females during the earlier weeks. The weights of the dwarf, No. 23, which has lived the longest are also plotted, and it will be noted that these are a little below the average of the 16 dwarfs for the first eight weeks.

Summary and Conclusions

Data on the general characteristics, pedigree records, and weights of 18 cases of dwarfism are presented.

The hatching records of the hens of the flock from which the dwarfs were hatched, together with the egg production and egg weight record of these dams are discussed.

The pedigree records seem to indicate that the characteristic is a simple recessive, which appears when two heterozygous individuals are mated.

The ratio of normal to dwarf progeny, where both parents are known definitely to be dwarf-producers, is 46 normals to 11 dwarfs. The expected ratio if the characteristic is a simple mendelian recessive is 42.75 to 14.25.

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TABLE II.—Weights of dwarfs in grams and the average weights of 51 normal males and 52 normal females reared under the same conditions.

		Age in Weeks				
No.	1	4	6	8	12	16
760	51	197	318	440		
766	54	174	294	380		
938	40	112	175	240		
946	44	156	202	290		
950	39	146	246	340	540	720
958	30	120	190	300	500	660
23	41	124	202	313		720
45	47	125	206	303		740
63	39	134	238	395		630
A569	50	170	280	350	530	610
A156	42	126	166	200		
A646	42	134	200	.....		
A651	39	131	230	270	370	
A731	34	100	188	300	390	
A797	40	90	170	260		
A804	30	94	152	220		
Ave.	41.3	133.3	221	306	466	680
Ave. 51N ♂	46	190.8	366	590	1143	1753
Ave. 52N ♀	43.6	176.1	332	505	943	1363

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The data herein reported was obtained and compiled by the senior author and the literature reviewed by the junior author. The authors wish to express their appreciation to Dr. W. H. Gates of the Dept. of Zool., Louisiana State University, for certain suggestions in regard to the manuscript.

The United States Becomes An "Immigrant Exporting" Country

Probably for the first time in its history, the United States failed to gain in population through immigration during the fiscal year ending June 30, 1931. During that period 97,139 immigrants and 193,540 non-immigrants were admitted to the country and 61,-882 alien emigrants, 229,035 non-alien emigrants left the country. The total admitted 280,179, was 10,000 less than the total leaving, 290,916. The change in the immigration laws accounts for a considerable portion of the reduction in immigration, but economic conditions during the past two years has been a very important factor.

Racially, the groups showing a positive balance of emigration over immigration perhaps tends to increase the proportion of North-European stocks. The largest immigration surplus is of Germans. The largest emigration quota is of Mexicans, with 11,769 less in the U. S. at the end of the year. The racial trend of the pluses and minuses is, however, not very definite, and the most significant fact is that the totals are so nearly balanced that for the first time in its history, perhaps, immigration for the year might be said to have had no effect on the racial constitution of the United States.

Why Native Populations Decline

IL PROBLEMA DEMOGRAFICO NELL'AFRICA EQUATORIALE, by Carlo Valenziani. Comitato Italiano per lo Studio dei Problema della popolazione, Serie II, Vol. I. Pp. 109. Rome, 1929.

A decreasing native population in equatorial Africa is one of the serious problems confronting almost every colony. The author believes the decline was already under way before the period of white domination, but the latter has hastened it by the effect produced on native mentality. In the course of a few years cannibals in the stone age were thrown into the era of the automobile and radio. Details of vital statistics and analysis of the causes of depopulation make this a valuable and interesting contribution to a study of world-wide importance.

PAUL POPENOE.

HEREDITARY ATAXIA

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The Institute of Family Relations, Los Angeles, California

ONE of the rarer affections of the nervous system is an ataxia first described in 1861 by Nikolaus Friedreich (1825-1882), and hence usually called Friedreich's ataxia[3, 4]. If the basis of it is present in the germ-plasm, symptoms may manifest themselves early in life. The gait becomes uncertain and hesitating, with the legs wide apart. Tremors appear, frequently accompanied by the convulsive jerkings and twitchings that are oftener associated with chorea. Within a few years, the patient is usually confined to a wheel chair, though he may live for a long time. No cure is known.

Typical manifestations may be seen in the family (hitherto unpublished) which one of us (K. B.) studied at an eastern institution some years ago. The relationships are shown in the accompanying pedigree chart.

Though resident in America for a quarter of a century at the time the investigation was made, this family came from the Italio-Swiss frontier, speaking a mixed patois of French-Swiss-Italian origin. This is more significant, as a large part of the hereditary ataxia recorded has been shown to have originated in Switzerland,[6] where forty-six cases in 21 families were traced back to four original families. It is probable that these could have been related to each other, if adequate genealogical data had been available. It may well be, therefore, that the family which we here present was of the same origin. The father of the patients, a hatter by trade, had records of his ancestors for 300 years, and is positive that there had been no appearance of ataxia during that time. Only four generations are shown on our chart, as those were the only ones for which he could give details. Less is known of the mother's family, but as she and her husband came from the same village, it is not a rash surmise that the families were interrelated by marriages at some time in the past. Her father died at the age of 72, her mother at 71 was still living in Italy.

This couple had 10 children, equally divided in sex. The oldest girl (23) had married a year previously. Two boys (21 and 19) were normal.

The first affected child was Emma, who attended school until 8, when ataxia appeared. At 17 she was admitted to an institution, and died two years later. The death certificate gave the cause as gangrene of the lung, with Friedreich's ataxia as a contributory cause. Autopsy led to change of this finding to "double pneumonia and pericarditis."

The next child, Jennie, born 15 months after the preceding, attended school until 9, was admitted to the institution at 15, and died at 17. Autopsy established the cause of death as ascending paralysis, contributing cause Friedreich's ataxia.

A third affected child followed,—the boy Julius, who went to school until 10, taking manual training for the most part. At 15, when seen, he had lost the power of locomotion, and almost all coordinated movements of arms and fingers.

The course of the affection followed similar lines in the three. All seemed to be normal until about 7 years old; they learned to read; then they began to lose the power to walk, and soon deteriorated mentally as well as nervously. Emma at 14 could not even stand up, could not feed herself, and had become almost an imbecile. Jennie at 13 had lost her ability to read, as well as to stand or to hold herself in a chair, and was rapidly growing more stupid. Her legs were covered

with an erythema from the knees down, increasing to the toes which were almost purple. She could not extend the lower legs without pain. Reflexes were all absent, though she had full control of the sphincters. Julius at 11 walked awkwardly, had difficulty in balancing, fell forward or backward easily, did not respond to the usual tests of reflexes, but was still as bright as an ordinary boy.

The next to the youngest child, Dora, at 6 was already showing signs of ataxia. At 8 she staggered around only by placing her hands on some piece of furniture, and was fast becoming helpless both physically and intellectually.

Here, then, are four out of 10 sibs affected with one of the most serious nervous diseases known. While there is no record of a similar occurrence in the ancestry, the picture fits perfectly the workings of a pair of recessive genes, if one makes the reasonable assumption that it was in both sides of the ancestry because of intermarriage in some remote generation. It would be much more unreasonable to suppose that these two old families in a stable peasant community had never intermarried in the past. One could hardly ask for a better illustration of a defect behaving as a simple recessive.

Variable Dominance

The same defect would not be expected to behave in the same way in every other family, and study of published cases shows that it does not[2]. In some instances it is a typical dominant, frequently a dominant with some irregularities of expression. Still others resemble ours in being typical recessives, even more perfectly demonstrated because intermarriage in previous generations is proved.

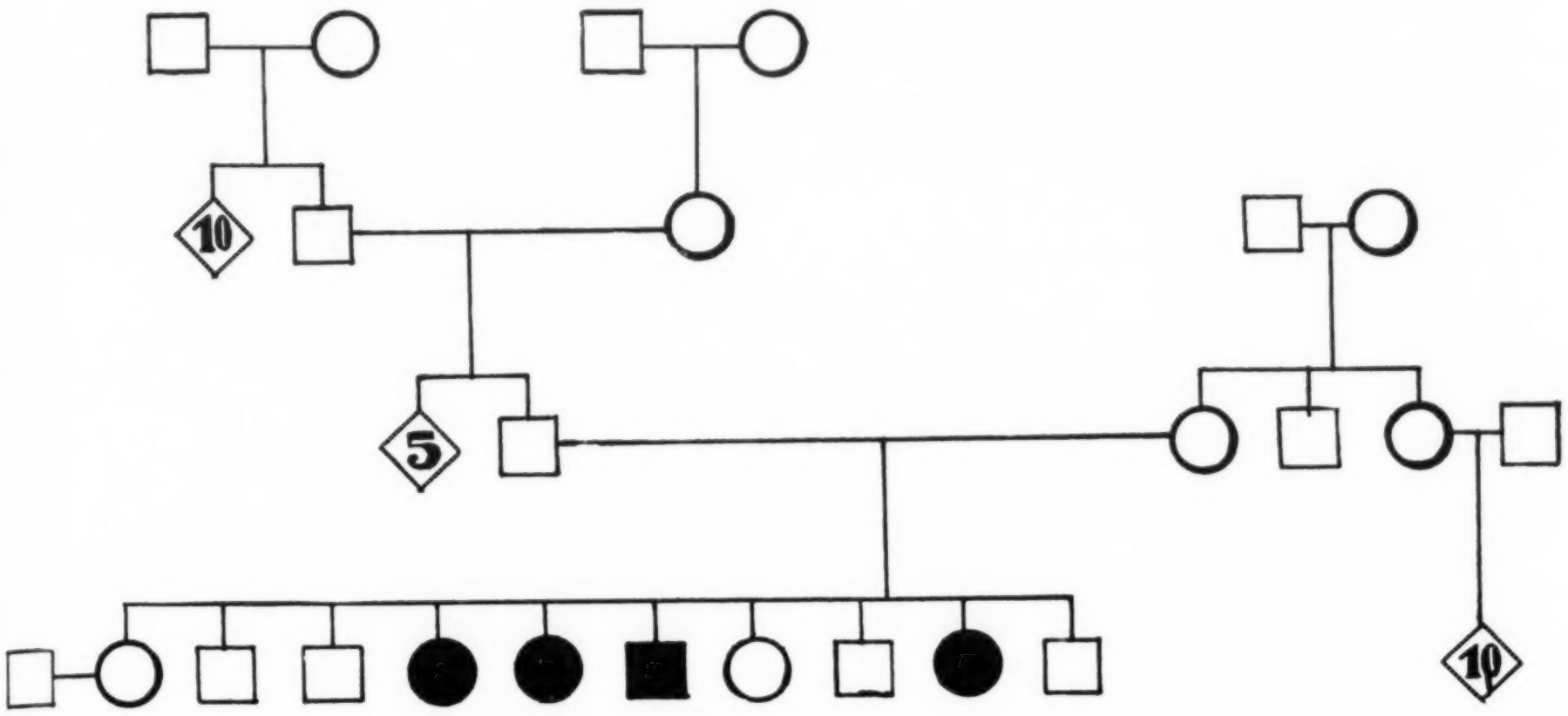
If one seeks more light on the action of this gene by studying the peculiarities of the patient, the difficulty is found to originate in the spinal column, and to result from the degeneration of various parts of this—the dorsal columns, the spinocerebellar tracts, the pyramidal tracts, the dorsal root fibres, and so on. Presumably these parts of the nervous system were made of inferior materials—to speak somewhat figuratively—so that they functioned fairly well for a few years, and then began to deteriorate. A crude mechanical comparison may be derived from an automobile in which some important part, say the gears, has been made of cast iron instead of steel. It will look sound at the outset, but it will not stand up under the wear and tear of daily use, and in a short time the car will be acting badly because of this defective part, although the rest of it may be in good condition.

Other Inherited Abnormalities

The number of cases in which an inherited human abnormality is not manifest at birth, but appears only some years afterward, is large. Conspicuous examples are pattern baldness, progressive deafness (otosclerosis), various eye defects, and nervous affections such as Huntington's Chorea[10]. The picture presented by hereditary ataxia is therefore a familiar one.

While the expression of every inherited trait is subject to wide variations, through the action of modifying genes, this is particularly conspicuous in the case of ataxia,—to the extent that attempts have been made to break it up into two or more distinct diseases. Thus cases involving the spinal cord alone are sometimes called Friedreich's ataxia, and those involving the cerebellum alone are called Charcot-Marie ataxia. But apart from the question whether in these cases the involvement is actually limited to the tract mentioned, there are so many intermediate types, including every possible transition, that it has gradually become clear to clinicians that the disease is one. With this conclusion the geneticist would agree.

Attempts made to distinguish different types of transmission in the different clinical pictures seem to depend merely on inadequate observation.



RECESSIVE FRIEDREICH'S ATAXIA
Figure 8

The chart above would hardly establish that Friedreich's Ataxia is hereditary. Many other pedigrees have, however, been published which have demonstrated unquevocally the hereditary nature of this disease. In some families the trait behaves as a dominant, in others as a recessive, as in this instance. (In this chart squares represent males and circles females, the diamond-shaped symbols represent normal fraternities of undetermined sex.)

Any type may behave typically as either a dominant or as a recessive, or more frequently as variable. The assertion[7] that the less serious forms are dominant, the more serious recessive, is likewise contradicted by a survey of the whole field.

If the gene responsible for ataxia is recessive to a marked degree, it will produce an effect only when present in duplicate, coming from father and mother alike (hence it is found that there is an unusual amount of consanguineous marriage in family histories of this affection). It is also evident that many persons must be merely carriers; that is, they have a single gene, which does not produce marked results in the lack of its mate.

But since the gene in other cases does behave as a dominant, it would be expected that even a single dose of it would produce some effects. Thus in a California family where the disease is irregularly dominant, the observer[8] reports that many of the relatives of a patient show nervous symptoms (tremors, uncertain gait, nystagmus, absent knee jerks and Achilles' reflexes, and the like). The most reasonable assumption is that these are individuals who have only a single gene, and that the modifiers tend to minify its effects. In cases where the single gene is attended by modifiers that tend to accentuate its effects, it may produce definite symptoms of ataxia; and of course it does so when it is present in duplicate.

"Abortive forms" of ataxia have been recognized clinically[11]. From a genetic point of view, these may be the result of modifiers, or they may represent heterozygotes—that is, persons who have a single gene, not a pair of them. They must be due to the same gene that produces the typical form of the disease, in any case.

The effects of modifying genes are really remarkable in this disease, and have been brought out strikingly in a recent study[1]. No two families are alike, and almost every conceivable part of the body may be affected concurrently in this way: muscles, bones, skin, hair, internal glands, and special senses have all been implicated. The age of onset is also modified characteristically. Thus in the pedigree chart reproduced herewith, the typical age of onset is about 7. In a family of Georgia whites[5], it is pretty regu-

larly 12. In the California family mentioned[8], the patient with whom the study began did not consult a psychiatrist until he had reached 37.

Early Evidence of Defects

Again, there are differences in the premonitory indications of onset. In the family we studied, there seemed to be no evidence of weakness until the actual breakdown began. As little children, Emma, Jennie, Julius, and Dora were as active and healthy as any of their playmates. In the Georgia family, on the contrary, the parents "in practically every case from late infancy through early and late childhood" noted "a certain nervous instability," which varied from "infantile convulsions to headache, or from easy fatigue to excessive nervousness." This again is the typical picture of family differences due to the presence of a different set of modifiers in each family.

Perhaps because it affects such an important part of the organism—the spinal cord and cerebellum—the gene responsible for hereditary ataxia produces more striking and far-reaching results than do many other single defective genes, and is more subject to the influence of modifiers. The spinal cord is one of the earlier parts of the embryo to be laid down. A defective gene in this may continue, through a long series of cell divisions, to exercise an influence on later stages of embryonic development. This has resulted in a picture of heredity which has confused almost every writer on the subject; simply because these writers did not have an accurate idea of normal inheritance, and expected a regularity which they did not, and could not, find.

In particular, they have attached an importance to dominance, which it does not have in fact. Dominance is not a part of the mechanism of inheritance at all. It is merely a developmental phenomenon, hence all the more subject to modification in the course of development[9]. Of this fact hereditary ataxia is a striking illustration.

Prevention

As there is virtually no treatment possible in cases of this disease, the real problem is one of prevention. This depends on the prevention of reproduction in affected families. Appearance of a single affected child might well be considered an indication for sterilizing the parents.

This would have prevented the birth of only one of the four children in our pedigree chart, however, because the affection did not become manifest in the first child until two more affected ones had already been born. Hence earlier possibilities must be considered. In the first place, all persons from families characterized by hereditary ataxia (particularly if there is also cousin marriage in the ancestry) should be warned of the probability of affected offspring. They might well be urged to undergo sterilization before marriage, unless they have compensating traits of social value to pass on, in a much more conspicuous degree than do any of the members of the families here studied.

In the second place, an individual from an affected family should be examined with particular care before marriage, by a competent neurologist. In some instances, it is probable that a thorough examination would reveal symptoms, in an impaired nervous system, which indicate the presence of the gene in question. Such persons should not marry at all, unless to some one who understands the possibilities; and in any event only after sterilization.

Summary

1. A new family history of hereditary ataxia is published, in which the affection behaves as a typical recessive.

2. A study of other published material shows that dominance is particularly variable for these genes, and the action of modifying genes is unusually conspicuous.

3. From a genetic point of view, all

the various clinical types of ataxia may be traced back to the same source, differences in symptoms being due to different modifiers, and not to different gene mutations.

4. Since the disease is incurable, it is a problem of eugenics rather than of neurology; and calls for sterilization of individuals who are likely to transmit it.

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The Increase of Mental Deficiency

THE burden of mental deficiency and defect is borne by the general population in a variety of ways. It takes its toll in accident and in reduced efficiency. It also takes a toll through general taxation—paid for the support of institutions for the defective and the deficient. It takes a heavy toll in happiness and well-being, which it is almost impossible to estimate.

Data on the extent and on the rate of increase in the tax-burden is given in a report recently issued by the Bureau of the Census, on the present status of state and private care of the feeble-minded and epileptic.* The data cover the years 1926 and 1927, and contain comparisons with earlier figures. On account of differences in methods of enumeration and in presentation it is emphasized that exact comparisons are difficult. The outstanding facts are these: In 151 state and private institutions in the United States in 1928 there were 60,419 feeble-minded and epileptic patients. In 1923 there were 42,954; in 1904 there were 14,347. The ratio of patients per 100,000 of total population has risen from 17.5 in 1904 to 53.1 in 1928. What part of this quadrupling in actual numbers is due to an increased incidence, and what part to better facilities and more accurate diagnosis is not clear. Of the total number of inmates in 1923 only 7.3 per cent were in private institutions, 90 per cent were in state institutions, and 2.6 per cent were in other public institutions. The burden of the support of institutionalized mental deficiency is borne by the public.

In 1927, 7,288 new feeble-minded patients were admitted to these institutions, and 1,950 epileptics. The distribution of male and female feeble-minded is about equal (3,824 ♂ to

* Feeble-minded and Epileptic in State Institutions, 1926 and 1927. Admission, discharges and patient population for State Institutions for feeble-minded and epileptic. Pp. 61. 26 tables. Price 15c. Washington, Government Printing Office. 1931.

3,464 ♀) but there is a definite preponderance of male epileptics: 1,140 males to 810 females. In recent years a more rapid increase in male epileptics has been noted.

In 68 state institutions in 1927 the staff personnel totalled 9,019 persons. Of this number 244 were physicians, 30 were psychologists, 110 were graduate nurses, 4,155 were attendants. The total cost of operating and maintaining these institutions was $22,425,135, the cost per inmate being $342.71. This compares with similar costs in prisons of $334.75, and in hospitals for mental disease of $307.81, per inmate per year.

"It is well known that only a small part of the feebleminded in the United States are in institutions established for their care," so that this report gives only an inkling of the total economic burden of feeblemindedness. The three-hundred-per-cent increase in ratio of institutional feeblemindedness to the total population is probably the most alarming statistic presented. The tax cost of the care of these unfortunates is at present only about a dollar per family for the population as a whole. If this amount more than triples every quarter century, as has been the case since 1904, it will rapidly become a very tidy item of taxation in the not-so-distant future. Probably the acceleration in tax-costs for this purpose is not as great as for more vocal "causes." Nevertheless it is rapid enough to be viewed with alarm by many who are today wondering where next year's taxes are coming from. If the rate of increase since 1900 is maintained, it will represent three dollars per family by 1953; $9.00 per family by the turn of the century. This assumes no acceleration of the rate of increase, which has been considerable in the past, and which if maintained might easily double or triple this already rather staggering figure.

Even though we fully agree with some of the rabid anti-eugenicists, abetted by a refinement of statistics, that feeblemindedness could probably not be altogether eliminated in a score of generations, it is nevertheless a fact that its *rate of increase* can be checked, not in a decade, but if we wish it sincerely enough, and are willing to apply existing knowledge, next year. Its incidence in the general population could be very materially reduced in 25 years, and with little inconvenience even to those concerned. Rapidly increasing feeblemindedness is a luxury that we appear willing to afford because we prefer to consider the problem emotionally rather than objectively. Perhaps the feebleminded are happier than the normal and if this is so their multiplication might be considered an advanced form of altruism. Those who have seen them "in action," trying to compete in a too complicated world, or in the rather dreary restraint of the average institution, can only feel amazement that such a view can seriously be advanced. At the present time only one state, California, is making any active and intelligent attempt to meet the problem. The rest of us are content to pay a dollar a year now and to look forward to paying three times as much in 1960 and nine or eighteen times as much by the turn of the century. One wonders, was Linnaeus really serious when he chose *Sapiens* as a designation for the fellow members of the species to which he belonged?

Economics of Mental Disease

THE term "mental disease" covers a great variety of conditions due to a large number of causes. Genes and germs and many other things have a part in initiating the events that cause people to be placed in institutions for the insane. Dr. Horatio N. Pollack, of the New York Department of Mental Hygiene* has attempted to place a value on the economic losses due to mental disease in New York State and

*Pollack, Horatio N. Economic Loss to New York State and to the United States because of Mental Disease. 1931. *Mental Hygiene* 16:(62)289-299.

has extended the computation to cover the entire United States.

The costs of mental disease are of two kinds: the cost of maintaining the institutions for the care of such sufferers, and the loss due to disability and death of the patients. In New York State the capital costs and costs of administration in 1931 were $44,914,504. Based on Dublin and Loka's research on the *Value of a Man,* Dr. Pollack concludes that the loss of productive capacity in 1931 amounted to $84,425,269, making the total cost of mental disease to people of the state of New York of $129,338,773.

For the United States as a whole, basing his computations on Federal statistics, Dr. Pollack places the figures for last year at $742,145,956, or roughly, three-quarters of a billion dollars.

Dr. Pollack classifies the various kinds of dementia causing this loss. The least important of these, numerically, is Huntington's Chorea, causing a loss of about a hundred thousand dollars in New York State. The most important is dementia praecox, causing about a third of the total loss. There is no question about the heritability of Huntington's Chorea. Identical twins with dementia praecox, and other evidence, suggest that this form of insanity also is largely determined by heredity. In these two items alone human genetics offers a possible economic saving of a quarter of a billion dollars a year, leaving out of account the less tangible but more tragic destruction of human happiness.

R. C.

Books Received

BOOKS are acknowledged in this column as received, and such acknowledgment must be regarded as sufficient return for the courtesy of the sender. As far as space permits, books that contain material of special interest to the readers of the JOURNAL *will be reviewed in later numbers.*

FOUNDATIONS OF ABNORMAL PSYCHOLOGY, *by* FRED A. MOSS, PH.D., M. D., Professor of Psychology, George Washington University, and THELMA HUNT, PH.D., Assistant Professor of Psychology, George Washington University. Pp. 548. Price, $4.50. Prentice-Hall, Inc., New York. 1932.

Abnormal heredity, too, in spots.

KLINISCHE UND VERERBUNGS-MEDIZINISCHE UNTERSUCHUNGEN UBER OLIGOPHRENIE IN EINER NORDSCHWEDISCHEN BAUERNPOPULATION, *by* TORSTEN SJORGEN. Pp. 121. Levin & Munksgaard, Copenhagen, 1932.

Genetics of feeblemindedness in a rather circumscribed peasant community, with unusually complete family records.

ANTHROPOLOGY AND MODERN LIFE, *by* FRANZ BOAS, PH.D., Professor of Anthrpology, Columbia University, and President of the American Association for the Advancement of Science. New and Revised Edition. Pp. 255. Price, $3.00. W. W. Norton & Company, New York. 1932.

Dr. Boas is one of those anthropologists who does not believe in Eugenics.

ZOOLOGY, A Textbook for College and University Students. *By* F. E. CHIDESTER, A. M., PH.D., Professor of Zoology, West Virginia University. Pp. 581. Price, $3.75. D. Van Nostrand Co., Inc., New York. 1932.

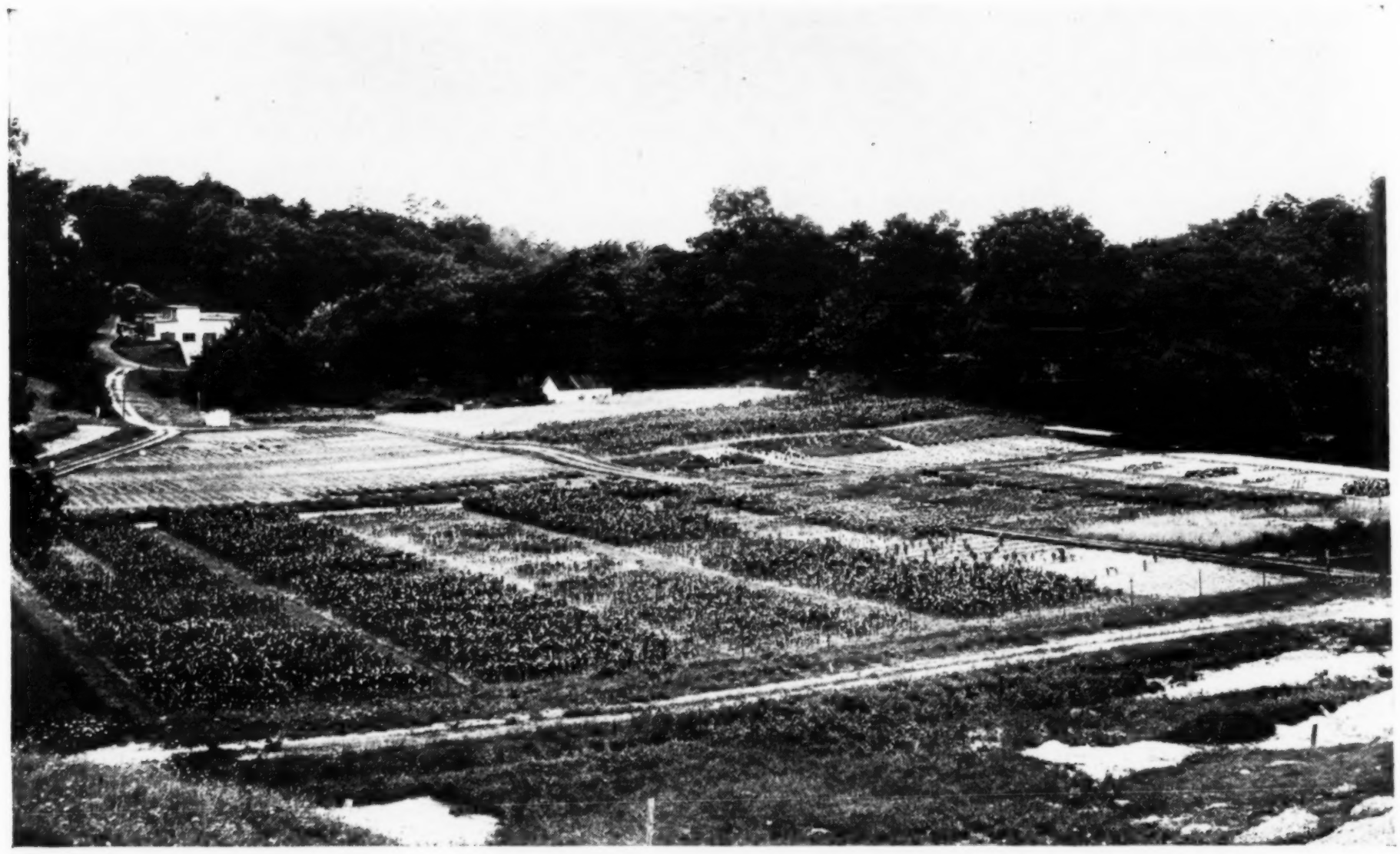
Our knowledge of the world that lives and moves has grown so great that 550 pages give space to cover it only rather breathlessly.

SEX TALKS TO BOYS (10 Years and Older). *By* IRVING DAVID STEINHARDT, M. D. Pp. 187. 12 Illustrations. Price, $1.75. SEX TALKS TO GIRLS (14 Years and Older). Pp. 193. Price, $1.75. 6 Illustrations. Lippincott, Philadelphia. 1914.

"Male and Female he created them," and the more civilized we get the more of a nuisance it seems to be for purposes of enlightenment. What does an aphid do, part of whose offspring are parthenogenetic and part not?

THE GENETICS CONGRESS

Arrangement of Program Nearing Completion—Live Plant Exhibit in Excellent Condition—Accommodations and Camp Sites at Ithaca



THE LIVE PLANT EXHIBIT

Figure 8

One of the outstanding features of the forthcoming International Genetics Congress will be the exhibit of growing plants, showing the forms used in Genetic research. It is probably not an exaggeration to say that no such varied and extensive a range of genetic types has ever been assembled in any one place.

RECENT reports from Ithaca indicate that the preparations for the Sixth International Genetics Congress are rapidly nearing completion. A Local Committee, headed by Dr. R. A. Emerson, has gone far toward making final arrangements for the entertainment of the Congress at Ithaca. A most interesting scientific gathering, truly international in character, is assured, and a varied social program will make the week one long to be remembered.

Program

The Congress will open Wednesday, August 24, with registration of members in Willard Straight Hall in the morning and an inspection of exhibits in the afternoon. That evening will be held the opening plenary meeting of the Congress, after which will be held an informal reception.

Five general invitation programs will be held on the mornings of Thursday, Friday, Saturday, Monday, and Tuesday. Speakers expected for these programs are: F. A. E. Crew, Institute of Animal Genetics, Edinburgh; C. B. Davenport, Carnegie Institute of Washington, Cold Spring Harbor; R. A. Emerson, Cornell University, Ithaca; H. J. Muller, University of Texas, Austin; O. L. Mohr, Anatomical Institute, The University, Oslo; N. Timofeeff-Ressovsky, Kaiser Wilhelm Institute fur Hirnforschung, Berlin-Buch; L. J. Stadler, University of Missouri, Columbia; M. Nawaschin, Timiriazeff Institute, Moscow; Karl Sax, Arnold Arboretum, Harvard University, Forest

Hills; C. Stern, Kaiser Wilhelm Institute fur Biologie, Berlin-Dahlem; O. Winge, Royal Veterinary and Agricultural College, Copenhagen; A. F. Blakeslee, Carnegie Institution of Washington, Cold Spring Harbor; Harry Federley, The University, Helsingfors; G. D. Karpetchenko, Botanical Institute, Leningrad; R. Goldschmidt, Kaiser Wilhelm-Institut für Biologie, Berlin-Dahlem; N. I. Vaviloff, Institute for Applied Botany, Leningrad; R. A. Fisher, Rothamsted Experimental Station, Harpenden; J. B. S. Haldane, John Innes Horticultural Institution, Merton; and S. Wright, University of Chicago, Chicago.

Six independent sessions covering in greater technical detail six different fields of genetic research will be held simultaneously on the afternoons of Saturday, Monday, and Tuesday. Demonstrations of the exhibits (see below) will be held on every other afternoon.

Thursday evening the address of welcome and response will be given, after which Dr. T. H. Morgan will give the Presidential Address, on the subject "The Rise of Genetics."

Friday evening, August 26, a picnic is planned for all members at Taughannock Falls. This is an unusually beautiful and interesting spot and arrangements are being made for camp fires, music, swimming, and other enjoyable features.

One of the most attractive features of the week's program is the excursion, on Sunday, to Niagara Falls. Even though one has seen the Falls before they are well worth many visits, and most advantageous arrangements have been completed with the railway company for this trip. Those who wish to take the trip in its entirety will leave around 7:30 Sunday morning, have lunch at an inn near the station on arrival at the Falls, take the Gorge Trip for two hours, have several hours to wander about at will, across the bridge, on Goat Island and other places of interest, have dinner at the inn and start back to Ithaca at seven in the evening. The entire expense for this trip, meals, Gorge trip and all, will be $5.50 and can be paid at one time. Those who prefer to arrange for their own meals and side trips can pay $3.00 for just the railway fare. In addition to seeing the Falls and the beautiful Gorge, this trip will give the members an unusual opportunity for informal visits and the small group discussions that form such an important part of the benefits to be derived from meetings of this nature.

Exhibits

The interest shown in the exhibits by members of the Congress is such that it is now almost certain that the exhibits will be one of the outstanding features of the Congress. More than 350 geneticists are taking part in the exhibit program. Exhibit material is promised from twenty-three countries located on six continents.

The garden of the Department of Plant Breeding, where the living plant exhibits are located, is already attracting the attention of visitors, as several exhibits are already beginning to bloom. Due to the efforts put into the garden exhibits, and the favorable weather conditions, the exhibit material is in excellent condition. The Oenothera exhibit, which is probably the largest collection of material of this interesting genus ever collected in any one place, is especially thriving.

The material for the indoor exhibits is beginning to arrive. These exhibits will be shown in thirty-nine laboratory rooms located in five adjacent buildings.

Meetings at the New York Agricultural Experiment Station at Geneva

The last day of the Congress, August 31, the activities of the Congress will be transferred to the New York Agricultural Experiment Station at Geneva. In the forenoon, papers will be read relating to fruit and vegetable breeding. During the whole day, fruit genetics and breeding exhibits will be open for inspection and they will be demonstrat-

ed in the afternoon. Members of the Congress will have the opportunity to visit the well equipped laboratories of the Station to view the unique collections of the living fruit and vegetable material and to attend the demonstrations of the experimental work carried on at the Station.

Accommodations at Ithaca

To enable members to obtain the kind of lodging accommodations they desire during the week of the Congress the Local Committee has recently sent out a statement regarding facilities at Cornell. This Committee is especially anxious to know by August 8 the names of all those who plan to attend the Congress.

The available lodging facilities in Ithaca, with rates for various periods, are indicated below:

Willard Straight Hall

Willard Straight Hall, the student union building, on the lower Campus, is headquarters for the Congress. Here members will register the first day. The evening reception and afternoon teas will be held there. Its cafeteria and dining rooms will accommodate the entire membership. Several small rooms are available for evening group conferences.

There are in Willard Straight Hall a limited number of bedrooms, mostly with running hot and cold running water, but without private bath, at the following rates:

Single rooms, $3.50 per day; $19.00 per week
Double rooms, $6.00 per day; $32.00 per week

One suite of two double rooms with connecting bath can be had for $14.00 per day or $72.00 per week, for four persons. Another suite of one double and one single room with connecting bath is available at $10.50 per day or $54.00 per week for three persons.

A dormitory on the top floor, accommodates 23 persons at $2.00 per day or $10.00 per week.

Prudence Risley Hall

This is one of the University residential halls. It is on the Campus a little over one-half mile from Willard Straight Hall. Mostly single rooms. The double rooms are large and have two complete sets of furniture. Adequate bath and toilet facilities on each floor. The rates are:

1-3 days, $2.00 per day
4-7 days, $1.75 per day
8 or more days, $1.50 per day

Sheldon Court

A private University dormitory just off the Campus at the south entrance about one-third mile from Willard Straight Hall. Sheldon Court accommodates approximately 100 persons, *men only*. Mostly single rooms. Adequate bath and toilet rooms on each floor. Free parking space off the street for about 30 cars. The rates are:

$1.50 per day or $8.75 per week

Student Rooming Houses

There are a number of good rooming houses, accommodating from five to twenty persons each, within two or three blocks from the south entrance to the Campus. The rates are:

$1.00-$1.25 per day according to length of occupancy.

Camping

Camping facilities are available on the University Campus. The Cornell Athletic Association offers free camp sites on a well drained grass plot back of the stadium. Tents may be pitched under the stadium if shelter is desired. Water, toilet facilities, and firewood are available. The College of Agriculture will furnish a guard from 8 A. M. to 11 P. M.

The Finger Lakes Park Association will reserve, on request, camp sites at Enfield State Park and Taughannock State Park. Upper Enfield, above the gorge, is eight miles from the Campus. Taughannock camping ground is in the woods by Cayuga Lake, below the falls. Camp site, water, toilet, firewood, and garbage disposal are provided for fifty cents per day, or $2.50 per week, per camp unit.

Sports

Free use of facilities for tennis, soft baseball, and quoits, are provided on the Campus. There are bathing beaches or pools at Taughannock, Lower Enfield, Stewart Park, two miles from the Campus, and Beebe Lake, on the Campus. Arrangements are being made for reduced greens fees for members of the Congress on the Country Club golf course.

All who expect to attend the Congress are urged to communicate with the Local Committee in time to make final application for accommodations by August 8, or as soon thereafter as possible. Address:

DR. R. A. EMERSON,
Cornell University,
Ithaca, New York.